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THE
LARYNGOSCOPE.

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REVIEW OF THE AVAILABLE LITERATURE ON THE PHARYNX AND PHARYNGEAL SURGERY FOR 1948.

FRANCIS E. LEJEUNE, M.D.,*† and R. E. STUART, M.D.,*
New Orleans, La.

PATHOLOGY.

In an excellent article on pathologic conditions of the nasopharynx, Harris[1] points out that most of the errors of diagnosis of nasopharyngeal disease lie not in ignorance of the disease in this location, but rather in carelessness of examination. Symptoms are many and varied, and these are thoroughly discussed. Mirror examination of the postnasal space is advocated and a pharyngoscopic examination is used as a check-up. The problem of treating diseases of the nasopharynx is admittedly not always simple. Various lesions are described and their accepted treatments are discussed. Malignancies are usually proved by biopsies and respond fairly well to radiation. Harris continues with the discussion of atresias of the nasopharynx and terminates with the problem of radiation in hypertrophied lymphoid tissue in this area. This arti-

From the Department of Otolaryngology, Ochsner Clinic,* and the Department of Otolaryngology, Tulane University School of Medicine,† New Orleans, La.

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cle was ably discussed by Wilkerson. We concur that it is one of the most comprehensive articles reviewed this year, well worth reading.

BACTERIOLOGY.

Kolmer and associates[2] conducted an investigation: *1.* to compare the nasopharyngeal bacterial flora of normal adults with that of adults who were suffering from the common cold, particularly in the early and late stages of the disease; *2.* to determine the relative incidence and quantitative importance of different micro-organisms in the nasopharyngeal cultures of those who showed secondary bacterial infections; *3.* to determine the influence of fever on the bacterial flora of the nasopharynx in normal persons; and *4.* to ascertain whether or not particular micro-organisms are responsible for secondary infections. Nasopharyngeal material taken from normal subjects and from those with the common cold between November, 1946, and May, 1947, was cultured and studied. During this time 332 cultures of material taken from 309 normal adults and 800 cultures of material taken from 146 adults who had a total of 209 attacks of the common cold were made and studied. The same micro-organisms were isolated from adults with the common cold as from normal adults; however, in the person with the common cold the incidences of beta hemolytic streptococci of Group A and staphylococci were slightly but definitely higher than in the normal control, and there was also a slightly increased incidence of H. influenzae. Although the incidence of pneumococci was essentially the same in the nasopharyngeal cultures of both series of persons, multiple cultures of patients with the common cold showed a definite increase of pneumococci as compared with multiple cultures of normal controls. The beta hemolytic streptococci of Group A, staphylococci, and pneumococci were found more often and in greater numbers in the late than in the early stages of the common cold. Gamma streptococci, staphylococci, pneumococci, H. influenzae and diphtheroid bacilli were isolated in cultures of material of normal adults more often during the Autumn and Winter months than during the Spring months. The beta hemolytic streptococci and the Neisseriae occurred

oftener during the Spring than during the Winter months. There was practically no difference in the incidence of coagulase-positive staphylococci in the cultures taken from the patients with the common cold and in those taken from normal controls. Thirteen different types of pneumococci were noted in cultures of material from normal controls as compared with 15 in cultures from patients with the common cold. The most common types of pneumococci in the cultures of the patients with the common cold were III, VI, X, XI and XIX.

Kolmer and associates concluded that the results of this investigation indicate that beta hemolytic streptococci of Group A, staphylococci, and pneumococci are important in producing secondary bacterial infections associated with the common cold, the first two types being the most important. Since the pneumococci of Types I and II were absent in this investigation, these authors suggest that the common cold may act to reduce the local resistance of the lower respiratory tract and thus favor infection with pneumococci that gain access to the upper respiratory tract through the patient's contact with carriers. Without discussing the merits of immunization against the secondary bacterial infection of a common cold, these authors suggest that if vaccines are employed for immunization they probably should be prepared of beta hemolytic and gamma streptococci, staphylococcus aureus, H. influenzae with special reference to beta hemolytic streptococcus of Group A. If the pneumococci are included, at least Types III, VI, X, XI and XII should be used.

DIAGNOSIS.

Because so little is found in textbooks on the description of the mesopharynx, Woodson[3] presents the results of his observations on this area and points out the necessity of differentiating certain signs and symptoms referable to the mesopharynx as definite diagnostic entities. The article is divided into the two parts: the first part, devoted to anatomy, physiology and pathology, is presented in detail with numerous illustrations and represents considerable work on Woodson's

part. Two important anomalies are considered: *1.* prominence of one side of the posterior wall of the mesopharynx much more than the other in many individuals, and *2.* the presence of two extremely large, curved, bilateral pulsating vessels (internal carotid) apparently just under the mucous membrane located in the midportion of the usual position by the salpingopharyngeus muscle. The second part consists in a discussion of several diagnostic entities. These include follicular pharyngitis, mesopharyngeal ozena, large lateral pharyngeal pillars and mesopharyngitis proliferans.

ANOMALIES.

Oldfield and MacNaughton[4] were able to study the action of the posterior pillars of the fauces through a large pharyngeal fistula. These pillars play an important rôle in the production of speech sounds, since their contraction assists in occlusion of the nasopharyngeal isthmus. Congenital abnormalities of the pillars result in speech resembling that of the patient with cleft palate. Syphilis and accidents associated with tonsillectomies are the commonest causes of severe deformity of the pillars of the fauces.

Oldfield and MacNaughton report three cases of congenital abnormalities. An interesting observation made by them is that the uvula, in their opinion, has no mechanical function and its contribution is in no way vital to nasopharyngeal occlusion. They conclude that nasopharyngeal occlusion is effected by a complex sphincter mechanism composed of overlapping muscle slings. The posterior wall of the isthmus is drawn forward to form the ridge of Passavant by the horseshoe fibres of the palatopharyngeal sphincter. This concise and well written article on a rather unusual subject should be of interest to all laryngologists.

Oldfield[5] points out that the main disability of the patient with a cleft palate is the defect in speech, and the operation for repair of the cleft palate represents merely the first stage of treatment of the speech defect. He thinks that it is, therefore, incumbent on the surgeon who has undertaken the treatment of such patients to supervise the after-care until normal

or nearly normal speech has been attained. To accomplish this it is necessary for the surgeon to understand the mechanism of normal speech. A description of the mechanism for the production of speech sounds is given in an informative and lucid manner. The persons used in the study of this mechanism were given bismuth meal so as to coat the lips, tongue and palate. In addition, lipiodol was injected along the floor of the nose and soft palate. Radiographs were taken during the articulation of various sounds. This represents an excellent article on cleft palate, which should be of much interest to those concerned with the mechanism of speech.

DIVERTICULA.

MacCharles[6] reports five cases of patients with pharyngeal diverticula operated on at Winnipeg General Hospital. Diverticula occur much more rarely in the pharynx than elsewhere in the gastrointestinal tract, except in the upper part of the esophagus. It usually occurs after the age of 50 years and is located low down on the midline of the posterior pharyngeal wall in a naturally weak spot between the fibres of the middle and inferior constrictor muscles. The etiology is not fully understood but is presumed to be incoordination of the swallowing mechanism. These diverticula gradually increase in size by retaining more and more food and press on the upper part of the esophagus. Thus, these patients usually have a mass in the neck. Fluids are more easily tolerated than solid food, so the patient either chews solid foods until they are converted to liquids or maintains a liquid diet. There is no other disease in which a patient will spend so long masticating his food. The diagnosis is easily made by various swallows. The mouth of the diverticulum is at the level of the cricoid.

Treatment consists in exposing the posterior pharyngeal wall through an incision in the left side of the neck, then determining the mouth of the diverticulum by passing a Levine tube into the stomach with the aid of an esophagoscope. The pouch is carefully sutured, or ligated if small, and removed. Feeding is accomplished through the tube for 10 days. Care is taken to avoid traumatizing the pharyngeal

wound, for if it is opened, severe cervical infection will develop. This is a concise, well written article on a condition that is infrequently seen.

A dissecting pharyngoesophageal diverticulum, purported to be the first of its kind reported in the literature, is described by Melamed and Walker.[7] It was situated posteriorly between the mucosa and muscularis of the esophagus. Ordinary pharyngoesophageal diverticula occur usually in middle-aged persons, whereas this dissecting diverticulum occurred in a 15-year-old boy. The position and dissecting feature of this diverticulum were not recognized until at the time of surgical intervention. The boy complained of symptoms of only one month's duration prior to operation. Comparison with the symptoms and position of pulse diverticulum is interesting.

Good observation of an unusual type of case makes this article worth reading.

Shallow and Clerf[8] present an analysis of 186 cases of patients with pulsion pharyngeal diverticulum treated since 1936 by a one-stage pharyngeal diverticulectomy. By this technique, which is described in the paper, the surgeon and esophagoscopist work together during the entire operation in order that the normal contour of the esophagus might be maintained.

Shallow and Clerf believe that these diverticula are caused by intrapharyngeal pressure acting during deglutition. This results in weakness between the lower most fibres of the inferior constrictor muscles and the upper borders of the cricopharyngeus muscles in most cases, although it occasionally occurs at other sites.

The most frequent postoperative complication in the 100 patients operated on was temporary paralysis of the vocal cord due to retraction of the recurrent laryngeal nerve at the time of operation. The one death which occurred in the 100 cases was due to coronary occlusion; one recurrence of the condition was noted postoperatively.

Mino and Murphy[9] report the case of an unusually large pharyngeal diverticulum, which was successfully treated by mobilization and exteriorization of the diverticulum, followed 10 days later by excision. The diverticulum measured 9 cm. in both transverse and anteroposterior diameters and extended from the first thoracic to the lower border of the thoracic vertebrae. It compressed the right upper lobe of the lung.

Mino and Murphy point out that everyone agrees that the only treatment of pharyngeal diverticula is surgical, except in the early stages before the sac has a definite neck; however, some prefer the one-stage and others the two-stage technique. Each has its advantages. In the case reported, the two-stage technique was performed because "the defect remaining in the mediastinum, even though temporary, dictated conservatism."

After a brief discussion of the development of pharyngoesophageal diverticula, Terry[10] points out that repair of esophageal diverticula is an exacting procedure, made all the more difficult because of the enormous elasticity of the esophageal wall and its irregularly plicated structure in its relaxed state. Some distension of the esophagus and sac is desirable during repair. A light is introduced into the diverticula and as dissection is carried out, the sac is clearly outlined. Before the sac is separated from its parent, the light is withdrawn and the esophagus intubated with a large Magill tube. The virtue of intubation is twofold: to maintain normal position of the pharynx and esophagus and to facilitate placement of sutures in their proper location. Frequent complications of this procedure are recurrences, fistular formation and obstruction.

This article further serves to emphasize that a generally accepted procedure as intubation of the esophagus offers certain valuable advantages to the surgeon. Aside from the purposes already mentioned, it helps prevent closing the esophagus too tightly, thereby producing constriction.

FOREIGN BODIES.

Fickling and Rowe[11] advocate the use of a faucial pack during extraction of teeth under general anesthesia to prevent foreign bodies entering the larynx. Several other types of packs are discussed and the position of the patients during extraction is considered important. The impression gained from this short report is that packs are no problem during general anesthesia, but the real problem is how to control the possibility of a fragment of tooth or filling lodging in the lower airway under local anesthesia.

Merkel[12] describes a case of a rubber suction cup from a dart impacted in the posterior nares of a boy, 12 years old, for 18 months. He was able to find only one other similar case in the literature. The patient had accidentally fired a dart with its rubber suction cup into his throat 18 months before and was able to retrieve the dart but not the suction cup. Roentgenograms of the chest and esophagoscopy done immediately after the accident gave negative results. The patient's gastrointestinal complaints dated from the time of the accident. Tonsillectomy and adenoidectomy performed three months after the accident did not relieve the symptoms. On nasal examination 18 months after the accident, Merkel found a mass at the posterior end of both inferior turbinates, which he removed at operation. Recovery was uneventful. This case emphasizes the importance of Roentgenographic examination beginning from the vault of the nasopharynx down to the ischial tuberosities in suspected foreign bodies, as advocated by Jackson.

PERFORATION.

In a discussion of the dangers of esophageal perforation, Franklin[13] briefly reports the case of a patient in whom such a perforation apparently occurred during performance of gastroscopy. On the fourth postoperative day the patient complained of discomfort and the temperature had risen to 101° F. Fullness of the lower part of the neck and displacement of the trachea as seen in the Roentgenogram confirmed the diagnosis. Immediate incision and drainage plus chemo-

therapy resulted in rapid recovery. This short communication emphasizes the urgent necessity for prompt action in such cases; delay results in a high case mortality rate.

ABSCESSES.

Richardson[14] reports a fatal case of hemorrhage from an internal carotid artery following incision of a retropharyngeal abscess in a girl five years old. One month after the abscess was incised the child was readmitted to the hospital because of profuse nasal bleeding, but examination failed to disclose the origin of the hemorrhage. After the bleeding ceased, she was discharged, but came back one month later because of a second attack of sudden profuse hemorrhage. This was followed a few days later by the fatal attack.

Richardson believes the lapse of time between the factual diagnosis of an abscess and a fatal hemorrhage in this case is unusual and is the longest of any reported in the literature. The symptoms, diagnosis and treatment of pharyngeal abscesses are discussed and it is suggested that the infection is probably spread by means of a lymphangitis which causes an adenitis of the glands lying along the carotid sheath.

Robelen[15] presents a report of a child six years old with a retropharyngeal and retrolaryngeal abscess treated with large amounts of penicillin, streptomycin, sulfadiazine and sulfathiazole. During the course of the disease, maculopapular and nodular cutaneous lesions appeared on the extremities. These subsided only after all medication had been discontinued. The question is brought up whether these lesions were bacterial metastases or represented an allergic response. Little can be drawn from this report because the nature of the rash was never determined. The blood culture remained sterile throughout; the nodules were never studied bacteriologically to determine if they contained the same organism found in the abscess, and the child was not subsequently tested for hypersensitivity to any of the drugs.

Korkis[16] divides abscesses of the pharynx and fauces secondary to acute infections of the pharyngeal structures into

two main groups: retropharyngeal and peritonsillar. The location and development of these abscesses are described. It is generally agreed that retropharyngeal abscesses occur most frequently in extremely young children, whereas peritonsillar abscesses are commoner in young adults. The diagnosis is not difficult if the pharynx can be visualized satisfactorily; however, the presence of trismus may add difficulties to the proper diagnosis. Cyanosis and respiratory obstruction are frequently present, as is also enlargement of the upper deep cervical glands. Incision and drainage with the head-low position is advocated, preferably under general anesthesia. If the patient's condition warrants a general anesthetic, a more thorough evacuation of the abscess is believed to be obtained, and the procedure from personal experience is much less severe on both patient and physician.

DISEASES.

Dell'Abate[17] reports what is believed to be the first recorded case of a patient who had entirely recovered in the interval between the initial oropharyngeal manifestations and the outbreak of a leucemic condition. The patient was a 33-year-old pregnant woman who had had a tooth extracted because of pain and swelling of the gingival tissues and tongue on that side. The local symptoms became worse, fever developed and local manifestations progressed to necrosis. The patient had an abortion. Local applications of salvarsan and rubiazol, antistreptococcic and antigangrenous serums, sulfonamides and vitamin C resulted in a sloughing away of the gangrenous areas, and the patient appeared to be completely well; however, a few days later left-sided pneumonia and cardiac insufficiency resulted, and the patient was transferred to the medical service, where a diagnosis of acute monocytic leucemia was made. The patient died a few weeks later.

Sharp[18] reports the case of a 65-year-old woman in whom blebs and blisters occurred on the soft palate, pharynx, left side of the tongue and buccal mucous membrane. These eventually broke down, forming small, yellowish sloughs which were extremely painful. The only relief obtained was from

aspirin-phenacetin mixture and applications of pure carbolic acid to the painful area.

In an interesting but brief paper, Goldstein and Calcagno[19] call attention to the fact that the incidence of diphtheria in certain sections of the United States increased in 1944 and 1945. They believe that this increase is expected to continue because of the high prevalence of diphtheria among the Germans and the veteran forces of the United Nations. Many of the American troops returning from Europe are undoubtedly carriers of virulent diphtheria bacilli, irrespective of whether or not they have had the disease.

Aside from the well established facts leading to the clinical diagnosis of diphtheria, Goldstein and Calcagno enumerate several points not heretofore suggested which proved of great help in making a clinical diagnosis. This clinical diagnosis of diphtheria is indicated if the exudate or membrane seems to have extended since the last examination, if the exudate extends above the faucial pillars or if the uvula is involved. A limited and fairly well demarcated area of hyperemia about the membrane and absence of extensive inflammatory reaction, especially early in the disease, are positive indications of diphtheria.

Of the 16 children with tuberculous cervical adenitis treated at the county branch of the Hospital for Sick Children in London, 70 per cent had tuberculous infection of the tonsils and three had tuberculosis of the adenoids.[20] Markham briefly records these cases, because tuberculosis of the adenoids is rarely mentioned in the literature. In none of the children was there clinical evidence of tuberculosis, and all were in apparent good health. Treatment consisted of removal of the tonsils and adenoids, compression of the glands in which abscesses have developed, and general care.

Siegel[21] made a study of the effect of sulfadiazine on the hemophilus influenzae, H. hemolyticus and Neisseria in 60 feeble-minded but physically normal institutionalized children who were nasopharyngeal carriers of these organisms. Throat cultures were obtained before and after the administration of

sulfadiazine from both treated children and the controls. Organisms were cultured in media containing 0.12 units of penicillin per milliliter.

H. influenzae was recovered from practically all cultures; only 71 per cent of cultures contained Neisseria. H. hemolyticus was found to be the most senstive to sulfadiazine and was absent when the drug was used. H. influenzae colonies were reduced in kind and number, but treatment with sulfadiazine did not rid the nasopharynx of the organism. Neisseria were totally resistant to the drug, the colonies remaining unchanged. Following discontinuance of the drug, colonies again became numerous even in those treated; however, with H. influenzae an increase in drug tolerance was noted.

An interesting and unusual case is reported by Spar and Williams[22] in which serious complications followed the use of nasopharyngeal packing for control of epistaxis. Spontaneous bleeding necessitated a pack in the nasopharynx for practically two weeks. Several days after the initial pack was inserted the patient complained of headaches. Necrosis and abscess formation developed in the nasopharynx as a result of the packing, together with a chain of symptoms including involvement of some of the cranial nerves. In addition, meningitis developed and evidences of osteomyelitis in this area became apparent. The infection eventually responded to chemotherapy and radiation.

Faber and associates[23] undertook a study to determine the modes of virus excretion in human poliomyelitis. They applied 20 per cent virus for 10 minutes to the central end of the divided infraorbital branch of the right trigeminal nerve in the cheek of Rhesus monkeys. On the third day heavy lesions were usually present in the homolateral but not the contralateral semilunar ganglion, whereas only occasional minimal lesions were found in the central components of the trigeminal system in the pons and medulla. At the same time, virus was detected in the homolateral but not in the contralateral ganglion. Pooled nasopharyngeal washings collected from the second to the fifth day, inclusive, also revealed virus.

They then treated four Cynomolgus monkeys of Philippine origin similarly and collected material and pooled them serially on the second, third and fourth days after exposure. The animals were killed on the fourth day. An 0.85 per cent solution of sodium chloride was washed through one nostril with a catheter and the returning fluid was collected from the other nostril. Both this material and the fecal and intestinal contents were concentrated by the technique of Silverberg and subinoculated intrathalamically into Rhesus monkeys.

Results of this study support the hypothesis previously suggested on anatomic grounds by these authors that when poliomyelitis virus, which is known to be axonally conducted, has penetrated a bony surface, entered the telodendria of a peripheral afferent neuron and ascended to the corresponding peripheral ganglia, where it can multiply and infect adjoining neurons, it would then be in a position to spread not only centripetally to the central nervous system but also centrifugally back to the surfaces supplied by the same nerve system. When the poliomyelitis virus was applied to the central end of a divided branch of the trigeminal nerve in the cheek, it traveled centripetally to the corresponding semilunar ganglion within three days. Virus was detected in the nasopharyngeal washings on the third and fourth days, which indicates centrifugal spread to the nasopharyngeal surface. Evidence that the virus had been followed was suggested by the fact that the virus was found in the stool on the fourth but not on the third day. These writers suspect that excretion, like invasion, of poliomyelitis virus occurs through axonal channels.

In a good review article, Schenck[24] describes the signs and symptoms, and treatment of acute lunar tonsillitis, chronic tonsillar and adenoid infections, Vincent's angina, retropharyngeal abscess, peritonsillar abscess and diphtheria. Brief case histories are included to illustrate these common infections of the pharynx and fauces.

Beck[25] describes a case of submaxillary, deep cervical infection in an infant two and one-half months old. A retropharyngeal abscess was suspected because of the symptoms; however, a radiograph revealed no widening of the shadows of the

retropharyngeal tissues but definite increase in size of the shadows of the base of the tongue with obliteration of the space between the base of the tongue and epiglottis and with backward displacement of these structures. A tentative diagnosis of submaxillary abscess was made. Following tracheotomy to relieve the dyspnea and evacuation of a large sublingual and submaxillary abscess, the patient completely recovered. Beck states that this was the youngest patient he had ever seen with Ludwig's angina type of infection.

A most interesting and unusual case of herpes zoster confined to the distribution of the glossopharyngeal nerve is described by Wright.[26] When the vagus nerve is involved, persistent nausea and vomiting are conspicuous features. In Wright's case there was ipsilateral involvement of the pharynx, tonsillar fossa, faucial pillars and soft palate. The lesions were extremely painful and responded poorly to medications but cleared up with the use of nicotinic acid and phenobarbitone. Nausea and vomiting persisted for several days.

In an effort to determine the frequency of beta hemolytic streptococcus in patients suffering from sore throat and the response of these patients to local sulfathiazole therapy, Fox[27] obtained throat cultures from 400 patients suffering from sore throat. Sixty-four of these had tonsillitis and 336 had a diffuse nonexudative inflammation of the pharyngeal lymphoid tissue and mucous membrane. An incidence of 75 per cent of beta hemolytic streptococcus was found in patients having exudative tonsillitis. These patients were given sulfathiazole gum to chew. The results in patients used as controls indicated that local sulfathiazole therapy was more efficacious than other types of treatment tried. The chewing of gum containing 0.25 gm. of sulfathiazole for one hour results in the deposition, in the crypts of the tonsils, of a discernible amount of sulfonamide compound.

Mangabeira-Albernaz[28] has written a lengthy article in which he proposes some changes in the classification and terminology of inflammations of the throat. This problem of classification of the different involvements and diseases of the throat has defied the skill and didactic ability of laryngolo-

gists. The difficulty is due to the fact that the throat does not represent anatomically or physiologically one single organ but a space made up of independent elements in which the upper digestive and respiratory systems are related. Acute tonsillitis is divided into several forms and the chronic into three. Pharyngeal infections are likewise divided into a number of forms, and anginas are classified into seven divisions with a multitude of subdivisions. This paper represents a great deal of work and a noble attempt to classify correctly the many ailments occurring in the throat, but it is thought that additional classifications and numerous subdivisions of known disease will simply add further burdens to an already overworked student.

Gustafson[29] made an experimental study in an attempt to isolate the etiologic agent of a disease of the upper respiratory tract in dogs which is frequently complicated by pneumonia and encephalitic symptoms. Nasal washings were taken from infected dogs and irrigated through the nasopharynx of normal dogs. Bacteriologic studies on throat washings from both infected and uninfected dogs failed to reveal any organisms which could possibly be considered as a causative agent; however, the results in the dogs which received washings containing antibiotics and those which received washings without antibiotics suggest that bacteria may have some counterpart in the syndrome.

The fact that the chorioallantoic fluid harvested from eggs which were inoculated with material used by the ninth passage was sterile is evidence in support of a possibility that the causative agent may be a virus. Moreover, disease of the upper respiratory tract developed 14 days after intranasal inoculation with this chorioallantoic fluid.

An organism isolated from the stools from some of the dogs and tentatively classified as a Shigella was studied to determine whether it had any relation to the diarrhea and the disease of the upper respiratory tract. Diarrhea with positive stool cultures developed in one out of four dogs after they were fed the organism. Gustafson could not state with certainty from his study that the Shigella organism was the

etiologic agent of the diarrhea observed in several of the dogs used for the passages. Moreover, the course of the disease of the upper respiratory tract in the animal receiving a suspension of it during the acute phase of this syndrome was not altered by this organism.

Arnaud[30] reports the results of treatment with streptomycin in 85 patients with pharyngolaryngeal tuberculosis. The intramuscular injection was employed in 67 and the aerosol method in 18 patients. Topical application was usually tried first, and if this was unsatisfactory, injections were given. Only mediocre results were obtained by aerosols, which were often poorly tolerated. The dysphagia was more readily relieved than the dysphonia and ulcerations. The results indicate that antibiotics are the best means, thus far offered, of treating tubercular pharyngolaryngitis.

Wille[31] reports a case of a 17-year-old boy, with no clinical evidence of tuberculosis except a weak Mantoux reaction, who had intermittent attacks of epistaxis for two years. The bleeding came from what appeared to be an ordinary adenoid growth. At adenoidectomy under local anesthesia an almost walnut sized tumor was removed. Histologic examination revealed some ulceration on the surface of the adenoid mass, some necrotic areas in the deeper portion with numerous epitheloid cells, and some typical Langhans' giant cells. The grouping of these cells was typical of tubercular structure. One year later there was almost no evidence of further tuberculous changes.

Neiman[32] presents the results of an experiment designed to test the efficacy of sulfathiazole in reducing the bacterial flora causing infectious pharyngitis. Included in the series were 129 medical students divided into three groups. The 79 subjects in Group A chewed gum containing 0.25 gm. sulfathiazole for one-half hour three times a day (total, 0.75 gm.); the 75 subjects in Group B served as controls and the 45 subjects in Group C chewed gum containing 0.25 gm. sulfathiazole once daily. This was continued over a period of eight months, including the Winter months, but apparently there were some intermittent periods when gum was not chewed. The subjects

were questioned at two-week intervals for a history of that period and those with complaints referable to the upper respiratory tract were examined by the student health officer. The chief concern of study was the incidence of infectious pharyngitis as determined clinically. The incidences of colds and of irrational pharyngitis are also reported.

Results of the investigation revealed that infectious pharyngitis occurred twice as often in Group A (0.75 gm. per day) as in Group C (0.25 gm. per day). Also, Group B (control) had nearly twice the rate of occurrence as Group A and thus four times the rate of Group C. There were no cases of sensitization and no reactions of hypersensitivity. Neiman considers this difference in rates significant and concludes that there seems to be a diminution in the incidence of primary streptococcic pharyngitis in persons chewing three sulfathiazole gum tablets daily.

There are several significant aspects brought out by this study not discussed by Neiman. There were seven cases of infectious pharyngitis in subjects taking the medication but occurring during periods when the gum was not being chewed. All seven of these belonged to Group A (0.75 gm. per day), whereas none occurred in Group C (0.25 gm. per day). Also, the rate of infectious pharyngitis of Group A was twice as high as that of Group C. Does this indicate a reduction of resistance of the patient, an increase in virulence of the organism or some other factor causing those on the larger dosage to be more susceptible to infection, or does it indicate that the smaller dosage is more efficient? Neiman does not discuss the severity of the infections which did occur in the groups receiving medication as compared with the controls. Also, he reports extremely high concentration of the drug locally, but no figures are given to substantiate this. Blood samples did not give a positive result for sulfathiazole.

A case of tuberculosis with involvement of the nasal passages and the nasopharynx is reported by Rosenthal[33] because of the rarity of this complication. It is apparent from the description of this case that the nasopharyngeal complication was secondary to a pulmonary infection. Although this article

is interesting, it does not add much, since the tuberculous infection was so extensive that the nasopharyngeal involvement could not be considered unusual.

The various types of carotid sinus syndrome are discussed, and the nerve supply to the carotid sinus is described by Ray and Stewart.[34] Surgical removal of this nerve supply is generally unsatisfactory, as all branches of the nerves are not always severed and too often the original symptoms recur. Ray and Stewart think the treatment of choice is intracranial section of the glossopharyngeal nerve, which is thought to be the main afferent nerve of the reflex. Good results have been obtained in the few reported cases of intracranial section of the glossopharyngeal nerve for carotid sinus reflex but a larger series of such cases is needed before intracranial section can be universally accepted.

Ravenna and Snyder,[35] in an excellent presentation of an interesting subject, call attention to several important points about infectious mononucleosis which are too frequently overlooked in the routine of a busy practice. They discuss the occurrence of edema of the pharynx and larynx in this condition and report that in more than one-half of the patients observed, the pharynx, arches, soft palate and uvula were a brilliant red. There was slight to severe edema of all the oral mucosa, which was most evident in the soft palate and uvula. Little or no exudate was present. The bright red color, the edema, the involvement of the soft palate and the uvula, and the paucity of exudate characterized this type of pharyngeal inflammation. Many times patients complained of little or no sore throat. Frequently, in infectious mononucleosis there is involvement of the cervical lymph nodes, which, as a rule, are painful to touch. The lack of response to sulfonamides and penicillin is strongly in favor of the diagnosis of infectious mononucleosis. The diagnosis is always confirmed by hematologic or serologic findings.

A case is presented of a patient who had considerable exudate on the tonsils, which eventually appeared in small areas on the arytenoid. The larynx was extremely edematous in this particular case.

There is no doubt that many cases of infectious mononucleosis are erroneously diagnosed as streptococcal pharyngitis, common sore throat, Vincent's infection, grippe or influenza. A large number of patients do not recover promptly after such common illnesses; it is possible that many are actually suffering from infectious mononucleosis, a benign disease but of considerably longer duration.

Dalton[36] calls attention to the frequent association of thyroid dysfunction and suppurative sinusitis with lymphoid hyperplasia of the epipharynx and the necessity of correcting these pathologic conditions, when present, before removing hyperplastic lymphoid tissue by physical means. In a review of his cases he found that 19.2 per cent of patients had thyroid dysfunction. Lymphoid hyperplasia was pronounced in 9.67 per cent, moderate in 32.88 per cent and slight or absent in 57.35 per cent. There was no sinus infection in 72.2 per cent, moderate infection in 20 per cent and severe infection in 7.8 per cent of cases. There were five times as many females as males. Hyperactivity of the thyroid gland occurred three times as often as hypoactivity. It is important to remember that slight thyroid dysfunction produces a more severe systemic reaction in a child than in an adult, and children respond more quickly and more completely to treatment than do older persons. Dalton points out the importance of following a stereotyped routine history and physical examination to avoid a mistaken diagnosis.

Bixby[37] reports the results of a study of 139 cases of diphtheria of the nasopharynx proved by positive culture encountered during a period of eight months at the 97th General Hospital in Frankfurt, Germany. Two methods of treatment were used. The first group of 88 patients received the "routine treatment" consisting of bed rest and the usual supportive treatment plus 100,000 units of diphtheria antitoxin intramuscularly. The second group received the same treatment as Group I, but in addition 200,000 units of penicillin were administered every three hours until 1,000,000 units had been given. The results of this study proved that the penicillin-treated patients recovered more promptly, required shorter

hospitalization, had fewer complications and showed a decrease in the incidence of carriers. This study proves the well known contention that penicillin is effective against corynebacterium diphtheriae. It is rather astounding that 139 patients with diphtheria of the nasopharynx should be seen in so short a time. Obtaining cultures from all patients with acute nasopharyngeal conditions would likely make us more conversant with this type of disease.

Rovenstine and Papper[38] describe a new technique for blocking the glossopharyngeal nerve, which they consider simpler and more effective than methods ordinarily used. It consists in drawing a line connecting points at the tip of the mastoid bone and the angle of the mandible and bisecting these, then raising a skin wheal at the midpoint of this line. A 5 cm. fine calibre needle is then inserted in a direction vertical to the skin for a depth of from 2 to 4 cm. medial to the surface of the skin until the styloid bone is encountered. The needle is then reinserted in such a way that the point passes 0.5 cm. deeper and posterior to the bony styloid. At this point the procaine hydrochloride is injected slowly after careful aspiration. From 4 to 8 cc. of 1.5 per cent solution of procaine injected on each side will produce adequate anesthesia of the tongue for about 75 minutes. Two illustrative cases are described. Block was performed in one for insertion of radium into the base of the tongue and in the other, a case of leucoplakia of the tongue, as a diagnostic measure before surgical interruption of the glossopharyngeal nerves was recommended.

In an excellent article, McLorinan[39] emphasizes the importance of performing tracheotomy in cases of paralysis of the pharyngeal muscles resulting from diphtheria or bulbar poliomyelitis. As stated by McLorinan, these patients have weakened respiratory muscles (intercostals and/or diaphragm) as well as excessive secretions within the trachea. These secretions are frequently aspirated, and this inhibits proper use of an artificial respirator by a nonpatent airway. Removal of secretions from the pharynx by suction is undesirable because it is traumatic and must be performed frequently. Trache-

otomy offers an easier and more thorough means of removing the secretions and lessens the burden on the weakened respiratory muscles.

Réthi[40] discusses the two known technical varieties of transverse pharyngotomy in which incisions are made above or below the hyoid bone, which have been designated as suprahyoid and subhyoid pharyngotomies. Since both of these approaches have certain disadvantages, Réthi made an attempt to devise a technique which would unite the advantages of both approaches, that is, the free insight upward and downward, excluding aspiration even in the cases of abundant bleeding and securing uneventful healing of the wound. This technique is always preceded by a tracheotomy and the pharyngotomy incision is at the level of and extends from one end of the hyoid bone to the other. A detailed description of the technique, which appears a bit complicated, is presented. The hyoid bone is severed in its middle portion and the mucosa of the pharynx is severed in a vertical line. The exposure obtained appears excellent for lesions or tumors on the base of the tongue, lateral pharyngeal walls, epiglottis and upper portion of the larynx. Two cases of goiter of the base of the tongue are appended. The one treated by suprahyoid pharyngotomy was followed by suppuration of seven weeks' duration and descensus laryngis. In contrast, uneventful healing followed transverse pharyngotomy in the other case.

Kilbourne and Loge[41] present the results of one phase of an investigation of 127 men in an army camp who contracted hemolytic streptococcal pharyngitis. The criteria for diagnosis were strict and apparently well observed. These men were divided by rotation into three groups without regard for the severity of their illness when admitted. A group of controls received no therapy specific for the disease; another group received intermittent therapy (300,000 units crystalline penicillin in aqueous solution once daily for six to seven days); the third group received continuous therapy (20,000 to 50,000 units crystalline penicillin in aqueous solution every three hours for four to seven days).

The antistreptolysin titre was followed on the various patients with the following results: the untreated group showed a relatively high rise in titre in a large percentage of cases, the group receiving continuous therapy showed a rise in titre less frequently and in smaller magnitude, whereas the group receiving intermittent therapy showed an intermediate response in incidence and in degree.

The comparable efficacy of these three treatments is not reported in this paper, but the occurrence of late relapses is brought out. There were no relapses in patients who received continuous therapy or who had a rise in antistreptolysin titre. All patients who did have relapses manifested rises in the titre prior to or coincident with the appearance of the late sequelae.

From this study the conclusion was drawn that penicillin therapy suppressed the formation of the antistreptolysin titre in these cases of hemolytic streptococcal pharyngitis to a degree proportional to the duration of the antibacterial action of penicillin maintained during the 24-hour period, the response being suppressed more by continuous than by intermittent therapy. This may be significant in view of Kilbourne and Loge's observations and their report of other writers that later sequelae, such as rheumatic fever and glomerulonephritis, develop in those cases in which a rise in antistreptolysin titre occurs.

This investigation appears to have been well planned and executed, the conclusions are conservative and consistent with the findings, and the report is clear and concise.

Kyper and Cross[42] report a case of Thornwald's bursitis which was resistant to Roentgen therapy and surgical intervention. They believe the patient failed to improve probably because the cavity of the bursa, extending as it does back near the occipital bone, is inaccessible to the surgeon. They point out that if this nasopharyngeal cavity is chronically infected, it may act as a focus of both local and systemic complications. The chief symptoms are headache, chronic pharyngitis, postnasal discharge, sinusitis, frequent colds and

hoarseness. These bursae should be excised or the abscess should be opened if the median recess of the adenoid is closed because of inflammation.

Wenner and Tanner[43] conducted interesting experiments in an effort to determine risk of attack among persons living in households in which poliomyelitis existed. They showed that frequently in several members of a family, clinical or subclinical attacks of the disease develop and it was found that carriers of virus were concentrated about households in which there was a paralyzed patient. It is thought, therefore, that in these *loci*, apparently, there is wide distribution of virus in humans.

A widespread outbreak of poliomyelitis in Kansas served to carry out studies on cultures from the oropharynx, blood and stools. Throat cultures were made on admission to the hospital and during the ensuing days cultures were obtained from the throat of each member of the household. An interesting description of the work performed and an analysis of each family seen is tabulated. The results of the study showed that the virus of poliomyelitis has a wide distribution in members of these households. Wenner and Tanner were able to show that out of 24 members examined, 17 had poliomyelitis virus in their intestinal discharges and in seven virus was detected in the throat.

Theobald[44] presents a report of the study of the wide variety of symptoms and complaints referable solely to the epipharynx in 150 patients. All other factors which might produce the symptoms were carefully eliminated. Thus, a sinus condition producing postnasal discharge, epipharyngeal conditions, secondary to diseases of the nose, and allergic disturbances were not included. The ages of the patients ranged from five to 75 years, with the majority (16.6 per cent) in the 40 to 45-year range. There were 58 males and 92 females.

The most frequent complaint was postnasal discharge and the next was recurrent sore throat. The other complaints in order of frequency were cough, earache, recurrent colds, hoarseness, bronchitis, epipharyngitis, fever, bleeding, crust-

ing, occipital headache, asthma and tuberculosis. Each symptom is briefly discussed. In regard to epipharyngeal examination, Theobald prefers direct nasopharyngoscopy with the Yankauer speculum.

Treatment in these cases consisted of operation, irradiation and local therapy. Hypertrophied lymphoid tissue was treated by surgical removal followed by radium, according to the Crowe technique. Local treatment usually consisted in cauterization with 5 per cent solution of silver nitrate; those who did not respond to this were treated with radium. A note of warning is included concerning the question of previous radium therapy and what the effects of irradiation therapy might be.

Morrison[45] reports the case of a 66-year-old woman in whom the IXth cranial nerve was avulsed by the extracranial approach for glossopharyngeal neuralgia. On the first postoperative day she had a severe attack of pain about the ear, which Morrison believed was due to central stimulation of the area from which the nerve was torn. Three years postoperatively the patient still has slight pain around the ear, which is relieved by aspirin, and some difficulty in swallowing dry food, which is overcome by drinking water. Slight facial paresis, evident in the early postoperative period, has disappeared. Of course, the right side of the back of the tongue, the right tonsil, the fauces and the right side of the soft palate are insensitive.

Morrison believes that the extracranial approach may be preferable to the intracranial route in elderly patients who are worn out from the pain. He cites the cases of two patients operated on by Williams in whom relief of pain has been obtained up to eight and 10 years, respectively, following operation. The technique of the extracranial route is described in detail because Morrison considers as unnecessarily severe some of the techniques referred to in the literature in which the posterior belly of the digastric and stylohyoid muscles and even the external carotid are divided.

Loge and Kilbourne[46] made a study of 184 patients with a preliminary clinical diagnosis of streptococcal pharyngitis

during a two months' period in the Spring of 1947: "*1.* to delineate the natural history of this epidemic of streptococcal pharyngitis in a young adult male population; *2.* to assess the value of two methods of penicillin treatment as compared with purely symptomatic therapy; *3.* to determine and evaluate the antistreptolysin response of patients in each of the three treatment groups." This paper is concerned with the natural history and results of treatment in 127 patients with streptococcal pharyngitis. The "untreated" group received hot saline gargles or irrigations, obligatory bed rest for three days and codeine when necessary. The "treated" group received, in addition to these measures, penicillin either in a single daily injection of 300,000 units for about a week or in dosage comparable to the usual experience.

The results indicate that penicillin, regardless of the method of administration, did not significantly alter the symptomatology of the disease but did reduce the period of pyrexia and leucocytic reaction. Pyogenic complications occurred in four untreated patients, in none of the patients who received penicillin in conventional dosage, and in two of those receiving the single daily dosage. Late complications of the infection occurred in none of the patients who received penicillin in the conventional manner, but rheumatic fever developed in three patients receiving intermittent penicillin therapy, and late complications occurred in two patients receiving symptomatic therapy. The five relapses occurred in penicillin-treated patients. The incidence of positive cultures observed at the end of three weeks was greatly reduced in the penicillin-treated patients. It was also noted that penicillin therapy reduced the incidence and degree of antibody response as measured by the antistreptolysin. There was less interference with the antibody mechanism in the patients treated with the large single daily injection of penicillin.

IRRADIATION.

In an article devoted primarily to a discussion of the American literature on the treatment and prevention of deafness of tubal origin by radium therapy, Reynaud[47] draws the following conclusions:

1. Radium therapy of the rhinopharynx can and must be employed with great possibility of success in children with deafness of tubal origin. In the adult the chances for success are fewer, but exaggeration of the secondary lesions of the middle ear can be prevented and the results are fairly good. It is important to treat young patients as long as there is lymphoid hyperactivity and instability of auditory function.

2. The salpingoscope and the nasopharyngoscope are the best means of making satisfactory and repeated examinations of the cavum in the child.

3. Radium therapy is not entirely without danger of intercurrent otitic complications. These complications have been rare in the hands of American physicians because of careful selection of patients and extreme care in the dosage and duration of irradiation.

Fox[43] discusses the need for treating children who have infected adenoids or sinus suppuration secondary to an obstructive adenoid mass. This article is concerned chiefly with the relative value of adenoidectomy and nasopharyngeal radiation. The latter is not a substitute for the former, for each has its definite indications and limitations, and not infrequently they are best used together.

Radiation therapy may be defined as the therapeutic use of the rays which emanate from radium. The mixture of the three rays is known as radon and may be captured in a capsule and used as such but is exhausted in a matter of hours. Also, the radium itself may be placed in a capsule and used. The alpha rays are of little value because they have no penetrating ability, being absorbed by the thinnest screen. The beta rays can penetrate up to 3 mm. of soft tissue and are completely absorbed by 1 mm. of lead. The gamma rays can penetrate up to 6 to 8 inches of soft tissues or 5.5 inches of lead. They are considered best for therapy, a suitable capsule being chosen to filter out the more numerous or more irritating beta rays. Deep Roentgen therapy is similar to gamma radiation except for the secondary effect on the tissues and organs penetrated to reach the selected part. In the usual

therapeutic dosage radiation does not destroy or remove lymphoid tissue. It inhibits mitosis and cellular multiplication and thus secondarily reduces the size of the mass.

In comparing surgical treatment and radiation, Fox points out three instances in which the former is better used: cases in which the mass in the nasopharynx is large, has never been removed, or in which immediate results are needed. Radiation is used if the amount of tissue is small or inaccessibly located. Both are advocated in children under two years of age because there is recurrence of some tissue in almost 100 per cent of these cases.

Fox uses combined deep Roentgen ray therapy and gamma radium radiation. The average patient receives 1,000 tissue Roentgens to the nasopharynx within 30 days, given in five to six divided doses. At the time of the second and fifth treatments 50 mg. hours of gamma radium radiation are given to each side of the nasopharynx.

The use of beta radium rays is found to be not quite so good as the combination of Roentgen ray and gamma radium but is the most suitable method for dealing with large numbers of cases, at the operating table and in young infants. The method is employed by way of a monel metal capsule with an outside diameter of 2.3 mm. and containing 50 mg. of radium. One to four treatments are required (usually three) at two to three-week intervals. The treatment consists of leaving the applicator in each side of the nasopharynx for 6.5 to 8.5 minutes. No visible results are manifested before four to six weeks, and usually longer is required. Fox cautions against indiscriminate use.

This is a good summary of the use of irradiation up to the time of its publication, but further changes have been advocated and at the present time a 50 mg. radium applicator is inserted to each side of the nasopharynx for 12 minutes.

Bernstein[49] states that irradiation of the nasopharynx is of great benefit in cases of deafness in children, due to partial occlusion of the Eustachian tubes by hyperplastic and chronically infected lymphoid tissue in and around the tubes, recur-

rent otitis media, and respiratory allergy. He uses the standardized monel metal applicator containing 50 mg. of radium salt. Dosage is varied to treat the individual case and is given at intervals of two or three weeks. Three treatments are usually sufficient. After preliminary cocainization the applicator is introduced along the floor of the nose. It is importtant to check the results by direct examination with the pharyngoscope. The significance of thorough tonsillectomy and adenoidectomy in addition to radium therapy is emphasized.

Hall[50] emphasizes the fact that the efficacy of irradiation to the nasopharynx lies in the sensitivity of lymphoid tissue to radium. The germinal centers are even more sensitive than the mature lymphocytes and the dosage advocated in these cases is just enough to arrest mitosis in the germinal centers. The result is that adenoid tissue gradually decreases in size. The indications for irradiation are reviewed; Hall uses radiation freely and so far no harmful effects have been noted in any of his patients. Occasionally it may be difficult to use on incorrigible children.

In an effort to find a shorter treatment time for the radium applicator in lesions of the trachea and bronchi, Crowe[51] and his associates experimented with the regular nasopharyngeal radium applicator, which is a monel metal capsule with walls 0.3 mm. thick and contains 50 mg. radium sulphate. They discovered that reduction of the thickness of the wall to 0.2 mm. increased the beta ray output 58.4 per cent. Of more importance was the discovery that 50 mc. of radon in the regular nasopharyngeal applicator had 2.5 times the beta ray output of 50 mg. radium sulphate in a similar applicator. The reason for this is that the radium sulphate itself acts as a screen to its own rays in addition to the screening action of the monel metal wall.

Since the original calculations for use of the radium sulphate applicator were based on results with the radon applicator, these calculations are now outdated because the application time is too short.

Further work established the new application time for nasopharyngeal lymphoid tissue as 12 minutes instead of 8.5 minutes. Thus the new treatment schedule with the 50 mg. radium sulphate applicator with monel metal walls of 0.3 mm. is three treatments of 12 minutes on each side at intervals of two weeks and an observation time of four to six months before further therapy is considered.

After reviewing the topographic anatomy of the Eustachian tube and presenting the rationale for radiation treatment of conduction deafness caused by nasopharyngeal hyperplasia, Seedorf and McKay[52] report their experience with this method in 53 patients treated at the Scott and White Clinic during 1946, in 44 of whom results were evaluated by questionnaire. The ages ranged from five to 68 years and there were 23 men and 21 women. Because most of the patients were transient, a single large dose was usually given instead of the preferable smaller repeated doses. At first from 500 to 590 r. were given, but this produced painful parotid swelling and loss of hair in the irradiated field; however, a bilateral dose of 360 r. was found to produce a moderate reaction or none at all.

Approximately 70 per cent of the patients noted improvement following Roentgen therapy. Of those, 87 per cent stated that improvement continued up to the date of questioning, which ranged from three to 12 months. Eighty per cent of the patients receiving 500 to 590 r. were benefited, with a large proportion of them showing "marked" benefit.

Seedorf and McKay believe that this study suggests that good results can be obtained with a single bilateral dose of 350 r. or less; however, they point out that small doses repeated at intervals of a week to a month for several treatments are better tolerated and produce equally good if not better results.

Jennings[53] discusses the indications for. technique of, and benefits obtained from the use of radium to the nasopharynx and describes three cases in which much improvement was obtained by this method. The article adds nothing new to the already voluminous literature on this subject.

Scal[54] outlines the indications for irradiation of the lymphoid tissue in the nasopharynx for the prevention of deafness and treatment of infections of the upper respiratory tract. Lymphoid tissue is known to be sensitive to radiation; the rays act on the germinal center of the cells, inhibit mitosis and prevent further function and growth of new lymphocytes to replace those destroyed. In a series of 38 cases treated by this method for impaired hearing, pronounced improvement in hearing acuity was obtained in the majority of cases. It appears that the present enthusiasm for radiation therapy is definitely warranted because of the excellent results obtained; up to the present time I know of no bad results developing in any patient who has received radiation therapy.

Fox and West[55] have devised a cylinder receptacle of chrome-plated brass, 17 cm. high, with an outside diameter of 4 cm., and walls 3.5 cm. thick, for cleansing the nasopharyngeal radium applicator supplied by the Radium Chemical Co. A cap of similar material fits over the cylinder. This cap contains an opening 13 mm. in diameter, through which the applicator may be inserted. It is almost impossible to overturn the cylinder since it has a wide, heavy base. Within the cylinder are numerous radially arranged bristles which run the entire height of the cylinder. A layer of absorbent cotton in the base of the container prevents damage to the radium capsule if it should strike the bottom of the container. The container is filled with a fresh solution of 10 per cent "caroid" powder in 1:1,000 aqueous solution of zephiran.

To cleanse the applicator it is held by its handle and inserted through the opening in the top of the receptacle and pushed down through the bristles and solution. It is moved up and down in order to loosen any adherent material and is left in the solution for about a minute. It is then replaced in a two-inch lead block for storage.

Adequate protection against the beta rays of the applicator during cleansing is afforded by the thickness of the brass walls. The "caroid" acts as a protein digestant and the aqueous zephiran solution as an antiseptic.

Jones[56] reviews the results obtained in the treatment of 136 adults who were given 331 irradiation treatments of the nasopharynx. The method of application followed the usual routine technique. Results were determined by answers to a questionnaire. Improvement in hearing was reported by a goodly number and surprisingly enough a number of patients reported improvement from the annoyance of tinnitus. The sensation of pressure, noted by some of the patients, was relieved and the incidence of colds was reduced.

Jones stresses the importance of accuracy in placing the applicator in the nasopharynx and justly believes that the position of the radium may be the determining factor in obtaining good or indifferent results. He further emphasizes the importance of applying irradiation before irreversible changes occur and considers the duration of the symptoms to be more important than the age of the patient. He concludes that irradiation therapy in selected cases offers better results in conservation of hearing and relief from tinnitus and pressure than any other current method of treatment.

The need for treatment of hypertrophied adenoid tissue is explained by Woodbridge[57] under two broad headings: *1.* children with repeated attacks of deafness and/or aural infection, and *2.* flyers with aerotitis. With reference to the former, Woodbridge points out that Crowe observed that more than 75 per cent of adenoidectomies, many in good hands, resulted in pronounced recurrence of lymphoid tissue. After discussing the various difficulties and disadvantages of using Roentgen rays on these children, Woodbridge concludes that the radium applicator is the most practical method of treatment. With reference to the problems of the aviators, the advantageous use of the radium applicator on those men making high altitude flights is pointed out.

This article brings out nothing new, Woodbridge having only recently started using the applicator himself. Instead, he quotes freely from two articles which previously appeared in national journals. He brings out two points which the abstractors question: *1.* that there is "a layer of diffuse lymphoid tissue beneath the epithelium throughout the length of

tube," and *2.* the implication that nasopharyngoscopic examination of the tubal orifices gives a correct indication of the function of the tube.

According to Neivert and Kallen,[58] the Radium Chemical Co. revealed that the container in common use for the nasopharyngeal radium applicator was designed for transportation only. It provides one-inch radial protection, which is inadequate against harmful rays. These authors report a unit which contains the necessities for treatment with, and cleansing and housing of the applicator. It also provides adequate protection in storage. The apparatus consists in general of a lead decanter of three-inch radius at the base and a cap for protection around the handle of the applicator. The whole is enclosed in a wooden case which contains the cleansing essentials and the time clock.

Minchew and Collins[59] present an excellent general review of radiation therapy of the nasopharynx for impaired hearing due to hypertrophied lymphoid tissue. They discuss the incidence, diagnosis and pathology of the condition. They recommend four treatments of radium, 12 minutes to each side, two weeks apart. Improvement of more than 15 db was obtained in 66 per cent of 18 of their patients with impaired hearing caused by lymphoid hypertrophy obstructing the Eustachian tube treated in this way during one year.

BENIGN TUMORS.

Waltner[60] reports two cases of extramedullary plasma cell tumors, which, he concludes, occur rarely in the nasopharynx compared to those arising in the bone marrow. These plasmocytomas are described as polypoid or sessile growths, or as a more or less circumscribed swelling of the mucous membrane. Some are large and others are no larger than a bean. Waltner points out that benign plasmocytomas may show malignant behavior many years after their discovery. As long as neither the clinical nor histologic appearance can give a reliable indication of the future course of these tumors, early radical removal of the extramedullary tumor associated with deep Roentgen therapy seems to be indicated in every instance.

Koop and associates[61] remind us that neurilemmonas may arise in any portion of the body where nerve sheaths exist. That the pharynx is an uncommon site for such a tumor is evidenced by the fact that only six such cases have been reported in this locality. Although these tumors are benign, they occasionally become quite large and because of their location are extremely difficult to remove endorally, so that in most instances they must be removed through a cervical incision. A case is described in which five neurilemmonas were removed; this brings the number of reported cases in the literature to 11. Good results were obtained in all reported cases.

According to Knight and Bunting,[62] only 37 cases of tracheal fibroma have been reported in the literature. They describe a case in a boy 20 years old. A lateral Roentgenogram revealed a large mass protruding from the posterior wall of the trachea, 5 cm. below the larynx. It was thought to be an adenoma. The tumor, which was occluding four-fifths of the airways, was completely removed and the patient had an uneventful convalescence.

Diamond and Perkins[63] report a case of calcified hematoma of the oropharynx secondary to a gunshot wound. It is reported because of lack of similar cases in the literature and as a contribution to the differential diagnosis of pharyngeal tumors. The patient was a 70-year-old man who complained of progressive hearing impairment of the left ear. Twenty-nine years previously he had been shot in the face; the bullet passed from the left side of the nose and through the roof of the mouth to the atlantoaxial region and had been left *in situ*. Examination revealed a 4 cm. smooth, bony hard, hemispheric swelling in the left lateral, posterior pharyngeal wall which showed as a calcareous deposit in the Roentgenogram. As there was some question of neoplasm, the mass was aspirated and 5 cc. of jelly-like material was obtained. This was reported by the pathologist as "calcific material." Diamond and Perkins felt that this represented a calcified hematoma and that no further treatment was indicated.

McFarland[64] reports a comparatively rare case of a lipoma occurring on the left side of the pharynx in an infant three months old. A diagnosis of retropharyngeal abscess was made; however, incision proved the mass to be an encapsulated tumor of yellowish white tissue and the histologic report revealed it to be a lipoma.

In a classic article, Martin, Ehrlich and Abels[65] discuss all phases of juvenile nasopharyngeal angiofibromas, which are neither common nor malignant neoplasms; nevertheless, these tumors present serious problems because of the complications invariably associated with their growth and treatment. Twenty-nine cases of juvenile nasopharyngeal angiofibroma are analyzed. It is generally agreed that all these tumors are highly vascular and noninfiltrating. The angiofibroma is one of the few types of tumors which exhibit a pronounced sex predilection; it occurs in the nasopharynx or posterior nasal cavity of pubescent males. The outstanding symptom is nasal obstruction, and later recurrent epistaxis develops. The etiology, histology and pathology of these tumors are discussed and the opinion is expressed that the clinical diagnosis should always be confirmed by biopsy. Martin and co-workers emphasize the fact that nasopharyngeal fibromas show some degree of spontaneous regression at the time of sexual maturity. It is interesting to note that complete regression of the tumor occurred in one patient who received sex hormone therapy. This therapy is advocated routinely by Martin and associates. Roentgen therapy is of much value as all hemangiomatous lesions are moderately radiosensitive. Implantation of radium needles or radon definitely helps to reduce the size of the neoplasm and constrict blood vessels. Surgical excision is hazardous and it is thought wise to ligate both external carotids when serious hemorrhage is a complication. If the size of the tumor has been reduced by radiation, surgical excision may be considered. Martin and co-workers are of the opinion that the prognosis as to life is excellent and it is thought that practically all patients with this type of neoplasm should recover and become free of symptoms when sexual maturity is reached.

This article represents one of the best attempts to discuss all phases of nasopharyngeal fibromas. It is highly probable, as suggested by Martin and associates, that a sex-endocrine relationship exists in these cases.

Lillie and Heck[66] report the case of a Filipino, 45 years old, with a chief complaint of recurrent cough of one year's duration and mild pharyngitis. On examination the left lateral pharyngeal band was found to be thickened, edematous and red, extending from the posterior tonsillar pillar inferiorly to the salpingopharyngeal fold superiorly. A preoperative diagnosis of hypertrophy of the left lateral pharyngeal band was made. The lateral pharyngeal pillar was removed. The pathologist reported the lesion to be a hemangioma. Neither Horner's syndrome nor paralysis of the vocal cord occurred postoperatively. This case is of interest because of the unusual location of the tumor on the lateral pharyngeal band, the unusual clinical symptoms, the rarity of occurrence of hemangioma in the pharynx and the fact that the tumor was not identified until it had been removed. Lillie and Heck postulate that the cough in this case may have been caused by vagal-irritation transmitted by way of the visceral sensory fibres to the pharynx.

Harkonen and Malmio[67] present the results of treatment of 31 patients with broad fibroma treated by Roentgen therapy alone, by operative and radium therapy, or by radium alone, between 1929 and 1945. Follow-up examinations were done on 21 patients and 10 answered questionnaires. The average age was 16.5 years. Of the 20 patients who recovered, three improved and in eight treatment has not been completed but the patients are improved. There have been no deaths. Of the patients treated either by operation alone or with radiation, 67 per cent recovered and 63 per cent of those treated by radiotherapy alone recovered. Of course, less time was required for treatment of patients by operation than by radiotherapy. Immediate recovery occurred in 50 per cent of patients with pedunculated neoplasms treated by Hopmann's operation. Radiotherapy either made the tumors disappear or limited their growth.

MALIGNANT TUMORS.

Wang[68] summarizes the results of his study of 36 cases of malignant tumors of the nasopharynx seen between 1937 and 1943 at the Chengtu Eye, Ear, Nose and Throat Hospital. The ages of the patients ranged from less than 20 years to over 70 years; nearly one-third occurred between 25 and 35 years. There were only three females in the 36 cases. Ninety-two per cent were carcinomas of some type — 19 instances of transitional cell carcinoma or lymphoepithelioma, 10 of unclassified carcinoma, four of squamous cell epithelioma, and one case each of lymphosarcoma, malignant melanoblastoma and reticuloendothelioma.

The tumor occurred most frequently in the lateral wall of the nasopharynx about the Eustachian tube, especially in the fossa of Rosenmüller. The appearance was usually a small, irregular, nonpedunculated mass which could be seen with the mirror. It was usually ulcerated, had a dirty gray exudate and bled on contact. It was generally not painful. The upper deep cervical nodes were usually involved, and this occurred early in the disease (50 per cent). The nodes were rubbery hard or cork-like. The overlying skin was not ulcerated or otherwise involved. The primary tumors in this series spread in various directions, including extension into the paranasal sinuses, especially the sphenoids and ethmoids. Extension upward involved the IInd cranial nerve in two cases, the IIIrd in five cases, the Vth in 17 cases, the VIth in 13 cases, the VIIth in six cases, the IXth in three cases, the Xth in 11 cases, the XIth in three cases and the XIIth in 12 cases.

Involvement of the structures of the head is divided into four groups: aural, nasal, ocular and others. Aural involvement produced tinnitus, altered sensation in the ear, impairment of hearing and aural discharge. The nasal symptoms consisted of partial or complete obstruction, attacks of hemorrhage, or blood-tinged mucoid discharge. The ocular manifestations were pain in the ocular region, ptosis, diplopia, exophthalmos and impairment of vision in advanced cases. The fourth group included bulging of the soft palate, pain in the forehead, side of face or temporal regions, numbness of

certain areas of the face or lips, dysphagia, hoarseness, enlargement of the cervical lymph nodes and metastasis to distant parts of the body.

The duration of early symptoms from onset to first examination was: two to three months in four cases, four to six months in 11 cases, seven to 11 months in seven cases, one to one and one-half years in six cases, two years in six cases, and three years in two cases.

Wang stresses the importance of a nasopharyngeal examination in any patient with the symptoms already mentioned, especially those of the nasal group, in addition to headache and cervical adenopathy. Headache was a prominent early symptom in 12 patients, nasal obstruction in 20, attacks of nasal bleeding and bloody discharge in 17, and cervical adenopathy in 18 cases. Nasal symptoms, in addition to tinnitus and impairment of hearing, occurred in 64 per cent of the cases and as a rule were among the earliest subjective complaints. Wang further stresses that biopsy should be done in the presence of any bulging, especially in the lateral nasopharyngeal wall, though it be smooth and regular. He points out that a positive result of biopsy is rarer after radiotherapy has been instituted and that a negative result does not exclude malignancy.

The prognosis in Wang's series was found to be bad, the disease usually running a fatal course in less than 3.5 years. The tumors were found to be inaccessible to surgery, but usually rather radiosensitive. The method used at the Chengtu Hospital was packing radium needles into the nasopharynx and inserting the needles into the regional lymph nodes when involved.

This report indicates a learned investigation of 36 cases. It confirms the work of others and emphasizes many significant phases of this important subject.

A study of 34 cases of tumors of the nasopharynx seen during the past 25 years is presented by Davis.[69] These included 19 cases of carcinoma, four of lymphosarcoma, 10 of angiofibroma and one of myxosarcoma. These types are com-

paratively rare and in many cases unsatisfactory to treat. The early diagnosis of these tumors is frequently delayed because they are hidden in a cavity which is difficult to inspect. Delay in consulting a physician early seems to complicate further an already difficult problem; however, this is probably due to the fact that there are no definite and reliable early symptoms which would seem to warn the patient of the existing lesion. Davis discusses the various symptoms and concludes that deep Roentgen ray therapy is the best treatment for nasopharyngeal malignancies. These cases are inoperable when first seen. Radium has not given as good results as Roentgen ray therapy. The problem of the nasopharyngeal fibroma, which occurs in males between the ages of 10 and 20, is also discussed. These are benign tumors which are extremely vascular and, therefore, present real surgical problems.

An interesting discussion of this article was given by Gardham, in which he marvels at the remarkable geographic distribution of these types of tumors. In Hong Kong, 25 per cent of all surgical malignant lesions were in the nasopharynx.

The variety of symptoms contributes to the difficulty of early diagnosis in these cases. Nasopharyngeal examination in those sensitive patients who gag easily can best be carried out by pharyngoscopic examination which will establish the diagnosis readily. Every patient with bizarre symptoms should be given the benefit of a pharyngoscopic examination and only in this manner may we hope to obtain earlier diagnosis.

The clinical characteristics of 46 cases of malignant tumors of the nasopharynx studied at Johns Hopkins between 1925 and 1946 are reviewed by Van Metre.[70] Sixty-three per cent of these tumors occurred in males and all presented symptoms primarily involving the nasopharynx, ears, cervical glands or cranial nerves. These symptoms, together with all other data, are elaborately tabulated for brevity. Van Metre states that in his cases if the first symptom was neurologic, in 85 per cent of the cases the Vth nerve caused the pain. The lymphatic drainage of the nasopharynx is rich and these tumors are highly malignant. Early extension via the lymphatics would

be expected. Because of the location of the tumor, involvement of the cranial nerves is expected.

Graham and Meyer,[71] who point out that fortunately nasopharyngeal malignancies are of rare occurrence, report 29 such cases encountered in a 10-year period. Because the lesion is not easily accessible, it is frequently overlooked. Over half of their patients had been under treatment and some had undergone operations for symptoms which were caused by the nasopharyngeal tumors. Other writers have reported similar experiences, proving that the nasopharynx, because of its inaccessibility, is too often neglected. The symptoms produced by nasopharyngeal lesions are frequently misleading and seldom do they direct attention to this area except when the lesion is well advanced. In Graham and Meyer's series transitional cell carcinomas predominated. Twenty-six of the 29 patients were treated by Roentgen therapy, the dosage and method of treatment being described fully. Only six of these survived. It should be noted that none of these patients was seen early as all had lymphadenopathy on initial examination, an indication of early metastasis. It behooves the rhinologist to exercise more diligence in examination of all patients with bizarre symptoms, for only in this manner can an early diagnosis permit a better prognosis.

Morrison[72] states that because carcinoma of the pharynx and tonsil is rare and produces minimal symptoms in the early stages, patients complaining of mild, persistent soreness, a burning sensation, mild dysphagia, slight "stuffiness" of the ears or similar symptoms should have careful examination of the entire pharynx with a head mirror, pharyngeal and laryngeal mirrors and the finger. A specimen for biopsy should be obtained from any mass, ulcer or area which feels different from the surrounding tissue. The prognosis of malignant lesions of the tonsil and pharynx has been rather poor because the diagnosis is usually made in the late stages after metastasis has occurred; however, early adequate treatment of patients with such lesions has given good results. Morrison, therefore, emphasizes the dangers of temporizing in such cases.

Cruthirds[73] presents a case of an angioepithelioma of the postnasal spaces in a boy four years old. One month following removal of the tumor and eight Roentgen ray treatments, the patient appeared normal in every way; however, five months postoperatively there was metastasis to the lungs and abdomen and the patient died.

Since most of these tumors do not present symptoms until fairly late, Cruthirds emphasizes the importance of routinely performing a thorough examination of the nasopharynx in any patient with nasal obstruction or pain in the head and neck. Only in this way can these tumors be detected early enough, since early treatment with Roentgen ray and radium offers the patient his best chance.

Greenfield[74] was prompted to report a plasmocytoma of the nasopharynx because of its rarity. He quotes several authors and concurs in their belief that although it is true that extramedullary plasmocytomas may vary greatly as to their malignancy and course, there appears to be little evidence to indicate they are not all malignant lesions and they should be so treated.

A case is reported of such a tumor occurring in a soldier 20 years old. Intensive million volt Roentgen therapy was given to the recurrent neoplasm in the nasopharynx. The cervical nodes responded slowly to irradiation. Greenfield states that originally the diagnosis in this case was reticulum cell sarcoma but because of its resistance to Roentgen ray a review of the histologic section was made and the diagnosis changed. When accessible, plasma cell tumors may be successfully treated by surgical excision combined with Roentgen ray. These tumors are radiocurable, but require intensive therapy to the lesion.

In a most thorough and interesting article, Hall and Friedman[75] relate the results of their extensive observations on the histologic changes in squamous cell carcinoma of the mouth and pharynx produced by fractionated irradiation. The administration of Roentgen rays in small daily fractions permits the normal epithelium to recover somewhat each day from

irradiation injury, whereas the less differentiated tumor cells, for the most part, show no evidence of recovery. Fractionation also increases the number of times each tumor cell is exposed to irradiation while in the premitotic or mitotic phase, which is believed by many to be the most radiosensitive phase.

The standard treatment technique is accurately described. The administration of each daily dose of radiation evokes a companion recovery effect. Successive doses of radiation become cumulative in their effect. Biopsies were taken at frequent intervals during this entire study to determine the progressive action of irradiation. The histologic changes produced in tumor cells following irradiation of squamous cell carcinomas are: *1.* the acute cell death, which occurs chiefly during the first week of irradiation, *2.* the characteristic cell change of enlargement of tumor cells, some of which attain giant size, and *3.* radiation keratogenesis, which is the acceleration either in rate or degree of the normal process of keratinization.

The observations of Hall and Friedman suggest that as a result of irradiation there is a pattern of progression from normal mitotic figures to giant-sized tumor cells to profound nuclear disturbances. In successfully treated carcinoma, mitotic division ultimately ceased.

In order to destroy a radiosensitive squamous cell carcinoma of the upper respiratory tract, it is usually necessary to produce at least a second degree epithelitis and epidermitis. These reactions of the skin and mucosa are an indication of the amount of destruction produced by radiation and serve as a guide in the treatment of the patient.

An analysis of the serial biopsies showed that 25 to 50 per cent of tumor cells were destroyed between the seventh and the eleventh days of irradiation, usually by acute cell death, which is considered the most significant of all radiation effects.

This is a most worthwhile paper full of knowledge of the subject and should be read by all referring patients with malignancies for irradiation so that they may have a better

understanding of the histologic changes which take place in irradiated tumors.

Friedberg[76] contends that the otolaryngologist is directly concerned with lesions which are primarily intracranial and which secondarily involve the nasopharynx or nasal cavities. Certain intracranial tumors involving the region of the sella turcica are known to invade the sphenoid sinuses, nasopharynx and nasal passages by direct extension. The most common of these are the pituitary adenomas and chondromas. The clinical and pathologic aspects of craniopharyngiomas, pituitary adenomas and chondromas are reviewed excellently by Friedberg and their reference to extracranial invasion is discussed. Clinical manifestations of headaches, nasal obstruction and excessive postnasal discharge, particularly if this latter is hemorrhagic, should make the otolaryngologist aware of the possibility of extracranial extension of sellar neoplasms. True adenocarcinoma of the pituitary may be extremely difficult to distinguish from a primary malignancy of the nasopharynx. Biopsy usually establishes the diagnosis and Roentgen therapy has been found to be the best type of treatment. The responsibility of the otolaryngologist in these types of cases is obvious. Every patient with a known or suspected lesion of the anterior or middle cranial fossa should have a careful nasopharyngeal examination. Although it is true that the types of cases reported and so well discussed in this paper by Friedberg are rare, nevertheless such a presentation should be studied by all otolaryngologists.

In an excellent article Orton[77] presents the results of his personal experience with 470 cases of carcinoma of the laryngopharynx. His results agree with some of our accepted facts about these lesions. In his series the most common malignancy of the laryngopharynx was the squamous cell variety and it predominated in males in the proportion 12 to one. The surgical indications for the various types of malignancies of the laryngopharynx are discussed. Orton correctly advocates radical excision for extrinsic types of carcinoma when operable and expresses the opinion that radiation is of little if any value. He further stresses that it is the duty of the surgeon

to aid in rehabilitating laryngectomized patients and help them to develop new voices. The statistics presented are interesting and informative and should be studied by all doing laryngeal surgery.

At periodic follow-up Roentgenologic examination of 195 patients with carcinoma of the hypopharynx, in addition to the usual primary reaction, Welin[78] observed, in five patients, increased width of the prevertebral soft tissue shadow and the recurrence of irregularity of the mucous membrane, changes which were strongly suggestive of a local recurrence; however, these changes disappeared without further treatment and there was no evidence of recurrence on clinical examination. Welin suggests that these changes are probably produced by a late reaction after irradiation or they may represent a reaction of the irradiated tissue to some extrinsic insult.

In an excellent article based on practical experience and sound reasoning, Lynch[79] reminds us that the nasopharynx is not the area of the upper respiratory tract most frequently invaded by malignancies, but it is one of the most serious sites. Lack of early symptoms is probably responsible for failure to make an early diagnosis in so few cases. Frequently metastasis occurs before the tumor is of sufficient size to produce symptoms. Lesions are most often found on the posterior wall of the pharynx and Lynch considers these malignancies to be much more common than reports in the literature indicate. The disease is primarily one of males. The pathology, histologic terminology, symptoms and diagnosis are discussed. Lynch correctly concludes that the treatment of choice for nasopharyngeal malignancies is radiation.

Baclesse and Dulac[80] point out that in cases in which clinical examination of the rhinopharynx proves difficult, radiographic examination of this region will indicate the existence of a tumor and its extent. Although lymphosarcomas, epitheliomas and lymphoepitheliomas — the most frequent malignant growths — produce similar shadows, they can often be distinguished by their location. For example, epitheliomas of the Eustachian tube have a particular aspect which makes it

possible to distinguish them from those arising at the level of the posterior-superior partition. The different anatomo-radiographic aspects as revealed in the Roentgenogram are discussed.

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SURGICAL PROCEDURES DIRECTED TOWARD THE PREVENTION OF HEARING IMPAIRMENT IN CHILDREN.*

PHILIP E. MELTZER, M.D.,
Boston, Mass.

To appreciate fully the problem of the surgeon whose task is to ameliorate or prevent deafness, one must comprehend the complexity of the structures that make hearing possible. Ear surgery is unlike any other type of surgery. The ear surgeon's task is not finished with the closing of the wound; he can leave very little to the natural process of healing. Ear surgery demands an exacting technique as well as an exacting after-care. The ear is a challenge to even the most skilled hands, and the surgeon must not only cure the disease but also must attempt to insure the maintenance of hearing. He must use his skill to leave intact, or as little damaged as possible, the tissues and structures involved in the conduction of sound.

The ear demands of the surgeon, first, that he know the anatomy thoroughly; second, that he understand the pathologic processes that may affect it; third, that he develop manual dexterity to a high order of excellence. These demands upon the surgeon may be fulfilled by apprenticeship and observation, also by practice on the cadaver.

The technique of ear surgery will not be described in detail; rather, an attempt will be made to clarify the conditions when it should be resorted to in the management of ear disease and for the prevention or amelioration of deafness.

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In the course of that clarification, there will be indicated what particular surgical procedures are most suited to accomplish these aims in certain given circumstances.

THE ROLE OF THE ADENOID IN DEAFNESS. DIRECT ADENOIDECTOMY.

It is amazing to note how frequently one observes the presence of a large mass of adenoid in children in whom there has been no history of otitis media of any kind, in spite of the fact that they have had numerous upper respiratory infections. It is also amazing to me to have observed the membrana tympani in children with typical signs of tubal obstruction and yet no complaint of the ear and, as far as could be determined, no hearing loss; however, we all know that the most common cause of deafness in children is the presence of adenoid tissue on and around the Eustachian tubes or an extension of an infection into the tube from contiguous infected adenoid tissue. When an adenoid mass is present in children with a history of otitis media, whether it be secretory or acute suppurative, the treatment is its surgical removal. More debatable is the question, Is surgery indicated in cases where the adenoid mass has already been removed, but there is evidence of regrowth? If the regrowth can be palpated or visualized with a nasopharyngoscope, the answer is emphatically *yes* — and by the technique of *direct adenoidectomy*.

What is meant by direct adenoidectomy? Direct adenoidectomy is the complete visualization of the entire nasopharynx, including the fossa of Rosenmüller, the torus of the Eustachian tube and the lateral salpingopharyngeal bands that extend behind the soft palate along the posterior tonsillar pillars. Direct visualization of the adenoid is best accomplished with the patient in the sitting position; because the operator is directly in front of the patient, he can work on either side of the nasopharynx without changing his position and this is important if one is to see and treat these least accessible areas. In the supine position with the head either flat or hyperextended there is too much tension on the tongue,

thereby limiting the mobility of the palate so that it cannot be elevated and retracted properly. I have tried the supine position innumerable times and have never found it to be comparable to the sitting position. The danger of this position is very effectively minimized by passing an intratracheal tube and packing the hypopharynx with gauze moistened in saline solution. Other simple procedures such as the immediate packing of the postnasal space with a large gauze sponge and making firm compression for a minute; this will slow down the bleeding considerably. Briskly bleeding vessels are made visible for this technique and can be clamped immediately. Compression by the hemostat for a few minutes will assure a completely dry nasopharynx. The assistant, all during the operation, constantly sweeps the suction tube across the oropharynx.

Although it is not my intent to go into details of any of the surgical procedures for the prevention of deafness, I do believe that this particular operation needs more than mere mention of it by title. In the sitting position the patient's head must not lie against the firm headrest but must remain free in the head holder's hands, so that it can be hyperextended and easily rotated. Any mouth gag which will not automatically hold the tongue firmly to the floor of the mouth or create tension on the pillars of the tonsil and soft palate can be used to keep the mouth open. Minimal tension should be exerted on the tongue in keeping it out of the field of vision. A Lothrop palate retractor is used to elevate the soft palate, and by varying the amount of tension on the soft palate with the retractor, almost every part of the vault can be visualized. The tori of the Eustachian tubes are readily recognized. By placing the lip of the Lothrop retractor behind the torus, with gentle lateral pressure, the fossa of Rosenmüller will be exposed. The head holder facilitates this visualization by thrusting the patient slightly forward at the hips and hyperextending the head so that the highest area of the vault may be exposed to view.

If the adenoid is being operated upon for the first time the mass is removed with the LaForce adenotome and the

bleeding controlled as described. Then, by lifting the palate with retractors as mentioned, the remaining lymphoid tissue is removed from the more inaccessible areas, such as the fossa of Rosenmüller, the tori and the salpingopharyngeal bands. It is essential that sharp, clean cutting punches be used with a perforated retaining basket. This procedure insures removal of practically every bit of visible lymphoid tissue.

In patients with regrowth of adenoid, much more meticulous care must be exercised for its removal. If there is a large mass present, begin first with the adenotome and then resort to the punches for the more thorough removal of the lymphoid tissue from the torus of the tube and fossa of Rosenmüller. In the vast majority of cases, recurring middle ear infection from contiguous tissues will be prevented by this procedure.

Is this operation a panacea? Certainly not, but it is the best procedure that I know of and has served me well for many years. I have removed adenoid regrowth from children who had previously been given a full course of radium or Roentgen ray therapy, yet suffered recurrent attacks of secretory or acute suppurative otitis media; after this type of surgery no further attacks occurred. On occasion I have willingly and happily resorted with excellent results to the use of radium and Roentgen ray in children on whom I performed direct adenoidectomy and failed to relieve them. There will always be a few patients in whom otitis media will recur despite surgical or physical therapy.

I cannot go along in principle with those proponents of radium or Roentgen ray therapy who substitute it for surgery regardless of the amount of regrowth. The use of physical therapy should be limited to patients with persistent recurrence of otitis media who have already had surgery, and in whom the lymphoid tissue is flat and cannot be removed by further surgery. Having failed to observe diminution in size of the lymphoid mass, even where the radium applicator was

in direct contact with it, you will understand why I prefer surgical removal to physical agents.

EARLY MYRINGOTOMY AS A PREVENTIVE PROCEDURE.

To even mention myringotomy as a surgical procedure for the prevention of deafness seems elementary and yet it is definitely an important preventive measure. Otolaryngologists are seeing fewer and fewer cases of acute suppurative otitis media in children. The reason is that the pediatrician or general practitioner sees the patient first, and since the advent of antibiotics both have developed strong resistance to early myringotomy, despite the strongest indications for its performance. The fault lies, perhaps, primarily with the otolaryngologists who have not sufficiently emphasized the danger of impaired hearing owing to unresolved exudate in otitis media; exudate that could and should have been drained by myringotomy. This is not by way of belittling the effectiveness of the sulfonamides or of antibiotic agents in controlling infection. The point is, that to ignore the harmful effect of delayed resolution of exudate on hearing in cases where antibiotics have been used borders on negligence. This antipathy to myringotomy by both physicians and parents is most unfortunate, as the price may be some loss of the child's hearing.

For that reason I urgently advise early myringotomy where the indications for it are present. It is a very important preventive measure and should be resorted to more frequently.

SIMPLE MASTOIDECTOMY AS A PROPHYLACTIC MEASURE.

There can be no question in anyone's mind about which step to take when, in the course of an acute suppurative otitis media, signs and symptoms of mastoiditis appear; but what about the patient who has had adequate chemotherapy in whom the landmarks of the drum membrane and the hearing fail to return to normal, or where the suppuration is minimal or ceased entirely? This is the type of case where judgment must be used in deciding whether to continue temporizing or to operate. Where suppuration has gone on for some time

and then ceases, the question is, can the inflammatory reaction of the middle ear structures be resolved to a degree where normal function can be re-established? In other words, is the inflammatory process reversible?

Without going into detail about any given case, I should like to emphasize the importance of not allowing persistent middle ear inflammation and the accompanying deafness to go on unchecked. I definitely recommend opening the mastoid and thoroughly exenterating the cells, especially in the region of the antrum for its effect in depleting the middle ear mucous membrane. The surgeon must take the initiative in resolving this tug of war between the organism and the therapeutic agent, with the patient taking the worst of it. The end-result of prolonged middle ear inflammation, even without suppuration, is in my experience some loss of hearing. In operating on these patients you will be amazed at the degree of decalcification and often suppuration, where chemotherapy and antibiotics have been used unsuccessfully.

AMELIORATION OF DEAFNESS IN MICROTIA.

Microtia occurs in a relatively small number of children, but when it does exist, particularly when bilateral, the surgeon must take some steps to help the child learn speech so that he may be properly educated. A special surgical procedure has been developed that can improve the child's hearing and bring it to a practical level.

In these children the auricle is grossly malformed and the external osseus canal as well as the membrana tympani is absent. The ossicles are generally rudimentary or poorly developed, and may be fused; the stapes is usually normal. In approximately one-half the patients the antrum and mastoid may be well developed. Where the cellular development is good, an operation described by Pattee[1] has succeded in restoring hearing to practical levels.

The following is a brief outline of the procedure: The posterior root of the zygoma is the most important landmark

and generally indicates where the antrum may be opened so as to expose the epitympanum and middle ear space. An incision is made over the area where the antrum is expected to be and the mastoid cortex removed. A conical exenteration of the cells is carried out with the apex toward the antrum. The lateral semicircular canal is readily identified, the incus and malleus are then exposed. Instead of following the Pattee technique of leaving only a small opening to the antrum, Dr. Edgar A. Holmes, of the Massachusetts Eye and Ear Infirmary, who performs these operations, on my suggestion, now enlarges the antrum considerably and removes the malleus and incus, thereby exposing the head of the stapes. A skin graft is pressed into the bony cone-shaped cavity, with the apex of the graft directly in contact with the stapes. This acts as an excellent conductive mechanism to the movable stapes.

This modified Pattee technique is a useful surgical procedure for the alleviation of deafness in certain severely handicapped children. For the deformity, the plastic surgeon may utilize one of several corrective techniques at his command.

CONSERVATION OF HEARING IN CHRONIC SUPPURATIVE OTITIS MEDIA.

In a previous paper titled "Hearing in Chronic Otitis Media," I discussed the various operative procedures wherein the hearing might be conserved. I did not have in mind children in particular. As this present paper deals entirely with children, there are several factors which should be clarified.

The paramount objective in the management of chronic suppurative otitis media has always been, and still is, to eradicate the focus of infection which may be a threat to life. Other considerations were that suppuration had to be eliminated, and if possible, hearing conserved. The saving of life made the other two desired objectives negligible. The frequency of chronic suppurative otitis media in clinics and in private practice has diminished tremendously in the past 10

years. No longer do we see children in whom the drum membrane and the ossicles disappear in a matter of days in the course of an acute scarlet fever or influenzal infection. There are areas in this country where prompt and adequate medical care is not yet available and I presume we will continue to be confronted with the sporadic case of chronic suppuration in children. These patients will require the best of judgment and skill in eliminating the disease and, at the same time, conserve hearing.

In children where the disease is limited to the epitympanum or antrum and the mucous membrane of the middle ear is simply thickened, the hearing very often is good. If before operation the parents are informed that an attempt is being made not only to eradicate the disease but also to conserve hearing, and that there may be a slight discharge from the ear following the operation, I am sure they will be happy to concur with the surgeon's wishes in order that the residual hearing may be saved.

Before entering into further discussion regarding surgical procedures, I must bring to your attention the excellent paper read before this Society in 1938 by Dr. J. Morrisset Smith,[2] wherein he described what he called "a graduated surgical technique" requiring only the complete simple mastoid operation in some cases or, where necessary, other more extensive surgical procedures. Dr. Smith's approach to the problem of the chronic suppurative ear is well planned and logical. My own approach varies somewhat in that it attempts to accomplish the desired result either by way of the external canal or by the Lempert endaural technique. I use the endaural technique entirely for modifications of the radical as well as the complete radical operation.

OSSICLECTOMY.

In children with chronic suppurative otitis media where the drum membrane is practically absent with only remnants of the ossicles present, ossiclectomy is my first preference. These cases are not commonly seen and, therefore, the oppor-

tunity for the use of this procedure is limited. It should be performed only in such cases where the Roentgen ray shows no evidence of enlargement of the antrum by either cholesteatoma or necrosis of cells. In other words, the operation is performed only where the disease is limited to the epitympanum and ossicles. It should not be attempted where granulations or polypi fill the middle ear space or where the external canal is too small to permit good instrumentation. It should never be performed in a patient with a history of acute exacerbations or where symptoms are suggestive of serious complications.

Ossiclectomy has fallen into disuse chiefly because the patients were not well selected and the procedure carried out without visualizing the cutting edge of the instruments. This resulted in damage to the membranous canal and middle ear mucous membrane and, not infrequently, to the facial nerve. All cutting is toward the operator and away from the medial wall of the tympanum. All instruments are of special design, particularly the bone cutting forceps. They must be sufficiently slender to pass through an ear speculum and still permit visualization of the cutting edge.

The operation includes the removal of what remains of the drum membrane and ossicles and the lateral epitympanic wall formed by the inferior surface of the squama as it fills in the notch of Ravinius. Dr. George L. Tobey[3] re-emphasized the usefulness of this operation in 1930. He advocated in a paper read before this Society, the removal of the lateral epitympanic wall so that the anterior end of the lateral semicircular canal could be seen. This gave an excellent view of the entire middle ear and tympanic space. This simple operation often results in a dry middle ear with preservation of the residual hearing.

The after-care of these cases is simple cleansing of the middle ear by irrigation with 10 cc. of peroxide diluted with equal parts of 70 per cent alcohol. These agents will wash out inspissated blood and debris. The middle ear may then be dusted with one of the following powders: *1.* Sulzberger-

iodine powder. *2.* Combination of the following powders: urea, 50 per cent; boric acid, 35 per cent; sulfanilamide, 13 per cent; sulfathiazole, 2 per cent. If the powder fails to dry up the ear, a culture will reveal whether the organisms are susceptible to penicillin or streptomycin. These agents may be used in combination: penicillin, 5,000 units per cc., and streptomycin, 25 mg. per cc. The ear is first cleansed with peroxide and alcohol solution, dried, and then five drops of this combined penicillin-streptomycin solution is instilled into the external canal and allowed to remain for five minutes so as to permeate the recesses of the ear.

EXTENSIVE SIMPLE MASTOIDECTOMY.

Where perforations of either Shrapnell's membrane or the membrana tensa are small, and the hearing is excellent, one may consider performing an extensive simple mastoidectomy as a preliminary procedure in the attempt to obtain a dry ear and conserve the hearing. This operation should include the exposure of the head of the malleus and incus, the removal of all granulations in the region of the antrum, as well as the exenteration of the perilabyrinthine cells. Smith advocates irrigation for several days to thoroughly cleanse the antrum and epitympanic region. This type of operation, if not successful, results in recurrent postaural abscess with continuation of the discharge. In the event of a recurrent postaural abscess, although simple incision and drainage is all that is necessary, the frequency of these recurrences distresses the child and parents very much, and they are likely to demand more permanent relief.

THE MODIFIED RADICAL FOR CONSERVATION OF HEARING.

This procedure may be resorted to when more conservative measures such as the extensive simple mastoidectomy has failed. It may be performed in those patients with large perforations of Shrapnell's membrane, with or without cholesteatoma. The operation is effective in patients with posterior superior marginal perforations where the disease is

entirely limited to structures of the epitympanum, antrum or mastoid. There is no point in performing a modified radical mastoidectomy unless the hearing is worth conserving. It has been my practice to perform the modified mastoidectomy without the preliminary use of the extensive simple mastoidectomy even in children. The exteriorization of the epitympanic space, antrum and mastoid not only prevents possible recurrence of postaural infection and other otitic complications but affords good access for the after-care of the cavity.

The extent of the disease determines the actual surgical technique. Where, for example, the ossicles appear normal or simply enveloped by thickened membrane, they need not be removed; they are left *in situ*. If the head of the malleus and the incus appear to be necrotic they should be removed.

The modified radical has come into its own since Lempert advocated the endaural approach for the eradication of disease of the temporal bone. The controlled instrumentation permits exposure of the malleus and incus without destroying their relationship. This approach has improved the chances for conserving hearing to a much greater degree than any other technique.

The modified radical should include the complete removal of the outer epitympanic wall and the widening of the notch of Ravinius. Thus, the head of the malleus and incus will be widely exposed for good inspection of the recesses of the epitympanum. Where the head of the malleus or incus is necrotic and it becomes necessary to remove them, the medial wall of the epitympanum is thoroughly curetted and a skin graft is placed in such a manner as to seal the middle ear space. The inferior margin of the graft overlies the upper part of the membrana tensa for about 1 mm. It is surprising how well hearing is maintained in spite of the removal of the incus and the head of the malleus. One would expect a severe drop in hearing, at least a 40 to 50 db loss, but where the stapes is freely movable and contained in a sealed tympanic space, I have observed practical serviceable hearing in these patients. Air-borne sounds are apparently conducted to the head of the

stapes with very little loss, a fact borne out by the work of Békésy.

If there is a large perforation of Shrapnell's membrane, so that the ossicles cannot be covered, it may be necessary to leave the head of the malleus and incus exposed as in a *bas* relief. The membranocutaneous canal wall is preserved and is used to cover the ridge as well as part of the mastoid cavity. The remaining portions of bare bone, such as the tegmen, may be skin grafted immediately. Although I have left the malleus and incus exposed in the epitympanum without covering them, I now do so with a small primary skin graft. The result has been very satisfactory.

COMPLETE RADICAL MASTOIDECTOMY.

Generally speaking, when one performs a complete radical mastoidectomy in children it is because there is extensive erosion by cholesteatoma, or a marked infection of the middle ear mucous membrane with granulations and polypi; or there are threatening symptoms which require the disregardance of conserving any useful hearing. When the complete radical mastoidectomy is to be performed by choice, the hearing should be good enough to warrant leaving the mucous membrane intact over the promontory and the windows. There is no point in trying to conserve very limited hearing if by doing so you sacrifice the opportunity to eradicate completely the disease, wherever it may be.

The important point that I wish to bring out in the performance of the complete radical operation, if hearing is to be conserved, is that the mucosa of the medial tympanic wall — namely, that over the promontory and the regions of the oval and round windows — must not be disturbed. One must use the gentlest of suction in these regions, even better would be the gentle absorption of blood with cotton wound applicators. If suction is preferred, the finger must not be placed over the opening of the tube. Violent suction does as much harm as rough instrumentation. If there are small, movable granula-

tions about the window they can be removed with specially designed middle ear curettes. In my experience the complete removal of the mucosa from the medial tympanic wall has always resulted in a further loss of hearing. Skin grafting of the tympanum proper in the complete radical operation has also resulted in further loss of hearing.

SUMMARY.

The most important surgical procedure for the conservation of hearing in children is, in my opinion:

1. A well done adenoidectomy. The well done adenoidectomy can best be accomplished by the direct visualization of the vault.
2. Myringotomy — which is a simple and very effective surgical procedure for prevention of deafness and should always be performed when indications are present in spite of the use of chemotherapeutic drugs and antibiotic agents.
3. In children with chronic middle ear suppuration where hearing is present, every attempt to conserve that hearing should be made by utilizing one or the other of the various simple or more radical procedures known to us, such as the extensive simple mastoid operation, the modified radical or the complete radical, without disturbing the middle ear mucous membrane.

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CARDIOVASCULAR EPISTAXIS AND THE NASO-NASOPHARYNGEAL PLEXUS.*

GEORGE H. WOODRUFF, M.D.,
Joliet, Ill.

In 1942, the type of nasal hemorrhage associated with hypertension and arteriosclerosis was described by the author,[1] and it was further asserted that this variety of nasal hemorrhage seemed to be a distinct clinical entity. The purpose of this article is to reassert this belief in the light of further experience and to describe a group or plexus of blood vessels which may be frequently involved in cardiovascular epistaxis.

The history alone will usually aid greatly in differentiating cardiovascular epistaxis from the other frequent variety of spontaneous epistaxis, the common nose bleed of Kieselbach's area, sometimes called epistaxis digitorum. The latter usually has a history of repeated minor bleedings over quite a period of weeks or months, gradually increasing severity as the minor trauma which caused it goes on. In contrast, the onset of cardiovascular epistaxis is usually sudden and severe, with a copious gush of blood from the nose or into the nasopharynx. The initial flow may cease spontaneously as the blood pressure is lowered, only to recur in a few hours as the pressure again rises. This sequence usually repeats itself several times, the patient meanwhile suffering more and more from loss of blood.

Epistaxis digitorum may occur at any age, but is more apt to occur in young adults and in children than in middle-aged or elderly individuals. Cardiovascular epistaxis, on the other

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hand, is an affliction of the middle-aged and elderly. The youngest patient in a series of 28 cases presented was 41 years of age.

Epistaxis digitorum occurs usually in individuals with a normal blood pressure; while in the cardiovascular type the pressure is nearly always distinctly elevated.

TABLE 1.

SUMMARY OF DATA ON PATIENTS IN WHOM BLEEDING OCCURRED IN THE LATERAL WALL OF THE INFERIOR MEATUS, FAR BACK.

No.	Name	Age	Blood Pressure	Location of Bleeding	Treatment
1	Mrs. J.	69	180/110	Lat. wall inf. meatus far back	Tamponage successful.
2	Mrs. W.	73	216/110	Lat. wall inf. meatus far back	Tamponage successful.
3	P.M. 1st time	55	215/110	Lat. wall inf. meatus far back	Tamponage successful.
4	P.M. 2nd time	56	210/110	Lat. wall inf. meatus far back	Tamponage successful.
5	Mrs. S.	73	185/100	Lat. wall inf. meatus far back	Tamponage successful.
6	T. C.	60	170/110	Lat. wall inf. meatus far back	Tamponage successful.
7	J. M.	72	188/104	Lat. wall inf. meatus far back	Tamponage failed in presence of deflected septum. Ligation ext. carotid successful.
8	O. S.	74	210/110	Lat. wall inf. meatus far back	Tamponage failed in presence of deflected septum. Ligation ext. carotid stopped bleeding. Pt. died suddenly, apparently from an embolus.
9	B. E.	52	220/110	Lat. wall inf. meatus far back	Tamponage failed in presence of deflected septum. Ligation ext. carotid successful.
10	Mrs. R.	40	135/90	Lat. wall inf. meatus far back	Tamponage successful.
11	Mr. C.	51	220/120	Lat. wall inf. meatus far back	Tamponage successful.
12	Mrs. W.	58	200/90	Lat. wall inf. meatus far back	Tamponage successful.
13	H. R. 1st time	65	210/100	Lat. wall inf. meatus far back	Tamponage failed in presence of deflected septum. Ligation ext. carotid successful.
14	S. S.	65	220/110	Lat. wall inf. meatus far back	Tamponage successful.

The location of epistaxis digitorum is almost invariably in Kieselbach's area, while the location of cardiovascular epistaxis may be anywhere in the nasal cavity. It seems to have a distinct tendency to occur outside the strict confines of Kieselbach's area. The most frequent single site in the 28 cases presented was in the lateral wall of the inferior meatus far back, as is shown in Table 1. Fourteen of the 28 hemorrhages occurred in this area. Other sites were the septum, just above and posterior to Kieselbach's area, an area high up and far back in the nasal cavity, the lateral wall in front of

TABLE 2.

SUMMARY OF DATA ON PATIENTS IN WHOM THE SITE OF HEMORRHAGE WAS IN OTHER AREAS.

No.	Name	Age	Blood Pressure	Location of Bleeding	Treatment
1	Mrs. B.	75	165/100	Lat. wall inf. meatus half way back	Tamponage successful.
2	Mrs. L.	76	190/100	Septum posterior to and above Kieselbach's area	Electrocauterization successful.
3	Dr. Mc.	70	210/110	Posterior portion nasal cavity, high up	Tamponage between septum and middle turbinate, far back, successful.
4	Mrs. W.	68	200/100	Posterior portion nasal cavity high up	Tamponage between septum and middle turbinate, far back, successful.
5	W. S.	68	175/90	Kieselbach's area	Electrocauterization successful.
6	M. B.	60	195/90	Kieselbach's area and above, general oozing	Tamponage successful.
7	M. W.	63	205/95	Bleeding not accurately located	Bleeding stopped after packing nose twice.
8	C. J.	58	205/110	Bleeding not accurately located	Postnasal pack inserted by resident, bleeding stopped.
9	H. R. 2nd time	68	205/100	Septum posterior to and above Kieselbach's area	Electrocauterization successful.
10	C. L. 1st time	50	190/95	Septum near Kieselbach's area	Electrocauterization successful.
11	C. L. 2nd time	51	190/95	Lat. nas. wall near ant. end mid. turb.	Electrocauterization successful.
12	M. M.	56	195/95	Kieselbach's area	Electrocauterization successful.
13	C. D.	51	180/90	Kiselbach's area	Electrocauterization successful.
14	Mrs. J.	65	210/110	Behind and above Kieselbach's area	Electrocauterization successful.

the anterior end of the middle turbinate, and Kieselbach's area proper. The distribution is shown in Table 2. In two cases the location of the bleeding was not definitely established.

It appears to me that the points just presented are sufficient not only to differentiate cardiovascular epistaxis from epistaxis digitorum but they also argue quite definitely that cardiovascular epistaxis is a distinct clinical entity.

There are, of course, instances in which repeated digital trauma and cardiovascular disease co-exist and share in the etiology of nasal hemorrhage. In such a case Kieselbach's area will sometimes show evidences of long continued minor trauma. In pure cardiovascular epistaxis the bleeding point is often a little posterior and above Kieselbach's area. It seems probable that in the presence of hypertension, when the bleeding point is in Kieselbach's area proper, the bleeding may have a dual etiology.

It does not appear that there should be any difficulty in distinguishing cardiovascular epistaxis from the rare varieties of spontaneous nose bleed such as heredoangiomatosis and the various diseases of the blood which interfere with the formation of a normal blood clot.

As my interest in this subject went on, I began to study the nasal cavity with the nasopharyngoscope, not only in patients who had had this type of hemorrhage but also in routine examinations. It was found that in many people there was a group or plexus of rather large blood vessels in the lateral wall of the inferior meatus well posteriorly (see Fig. 1). These vessels appear to come from the lateral pharyngeal wall and run forward to a point under the overhang of the inferior turbinate body where they become deeper and are lost to view. There is considerable variation in these vessels. In some people, particularly in the young, they are very small and not at all prominent. In others, particularly in some people of middle age or older, they are more numerous, quite large and often appear dilated. The appearance of these vessels suggests that

they are veins rather than arteries, though there are probably arterial vessels accompanying them at a slightly greater depth.

Because of their location in the exact area where bleeding is most frequently found, it seems quite probable that cardiovascular epistaxis often comes either from these dilated veins or from arterial vessels which may lie slightly deeper.

The name, naso-nasopharyngeal plexus, has been suggested by the author[2] for this group of vessels because they lie partly in the nasal cavity and partly in the nasopharynx.

The lateral wall of the inferior meatus of one patient was observed with the nasopharyngoscope just after bleeding had

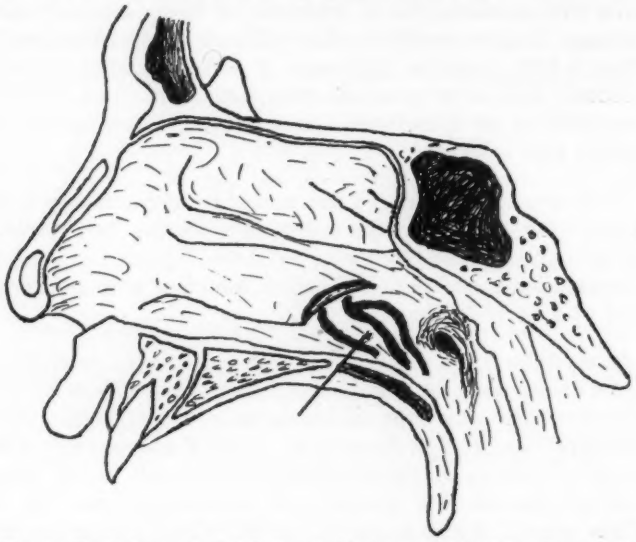

Fig. 1. Posterior end of inferior turbinate amputated to show that an area of frequent hemorrhage in cardiovascular epistaxis is the same area in which a prominent group of blood vessels, "the naso-nasopharyngeal plexus," is often found.

temporarily stopped. A portion of a blood vessel about three-eighths of an inch long was seen to be empty of blood; and it resembled a capillary glass tube in appearance. It was in the area of the naso-nasopharyngeal plexus.

In many people with advancing years the veins become diseased as well as the arteries, and phlebosclerosis is perhaps as common as arteriosclerosis, although it is often passed over or neglected. It may be that some of the severe hemorrhages come from diseased veins which usually lie more superficially than do the arteries. Also, cases have been described by Friedberg[3] and others in which the superior vena cava was severely constricted by a neighboring tubercular process, resulting in impeded circulation in the head and neck as well as in the upper extremities. Bleeding from the nasal cavity occurs in these cases.

The treatment of cardiovascular epistaxis depends upon its location. Consequently the first step is to locate the site of the ruptured vessel as accurately as possible. If it is Kieselbach's area or some other spot well anterior, the exact bleeding point can be well visualized and exactly located. In such a case the electrocautery has been the agent of choice in my hands and it has been effective. Electrocoagulation should work equally well. An alternative method would be the use of a sclerosing agent, such as sylnasol, though I have not tried it in this type of bleeding.

When the hemorrhage comes from the posterior part of the nose or even high up anteriorly, it is sometimes very difficult to locate its origin accurately. Obviously local anesthesia and decongestion of the nasal membranes are essential in locating the site of the hemorrhage and in treating it after it is located. Suction is of great aid in removing blood as fast as it appears. Gross clots and pools of blood should be expelled by the patient by clearing the throat and blowing the nose before attempting localization.

When the ruptured vessel is in the extreme posterior portion of the lateral wall of the inferior meatus it is obviously impossible to locate it with exactitude and electrocoagulation and electrocauterization are very difficult to carry out without damaging considerable uninvolved mucous membrane. The method which I have favored has been given the name "precision packing" or "precision tamponage." Solutions of tannic

acid and antipyrine have been found to be valuable in carrying out this tamponage. A rather firm tampon slightly larger than a lead pencil and about two inches long is fashioned out of long fibre cotton. A small amount of 4 per cent aqueous antipyrine solution is poured into a medicine glass and an equal amount of a 4 per cent aqueous solution of tannic acid is added. There results a rather heavy rubbery precipitation into which the tampon is plunged. It is then inserted into the nose with a bayonet type dressing forceps and is wedged firmly and with considerable pressure into the angle between the lateral nasal wall and the overhang of the inferior turbinate. Two or three more such tampons are inserted to fill the inferior meatus and to insure firm pressure on its lateral wall, especially in its posterior portion. One more dry tampon is usually wedged firmly between the inferior turbinate body and the nasal septum to hold the other packs in position. The tampons are inserted just far enough so that the posterior tips just reach the choana. An excellent precaution to keep the tampons from slipping backward is to tie a piece of suture material to the anterior ends and fasten them to the cheek, though I must admit that I have used them without the suture safeguard and have never had one slip backward. The tampons are usualy left in place for five days; but if they loosen in three or four days, as sometimes happens, the loosened ones are then removed. In my experience, if bleeding can be completely arrested for five days, sufficient healing takes place so that the result is permanent.

Unfortunately in the presence of a deflected septum of any considerable degree, tamponage of the inferior meatus may be very difficult or even impossible to carry out effectively. In such a case, if the bleeding is close enough to, or in the choanal opening, it may be controlled by drawing a pack forward into the choana and nasal cavity from the pharynx, thus making direct pressure on the bleeding area. The so-called Bellocque pack described by Waldapfel[4] may be used for this purpose. Additional packing may then be placed against this choanal plug through the anterior nares. If the bleeding point is in the nasopharynx, a postnasal pack should prove effective; but I do not favor postnasal packs if the bleeding area

is within the confines of the nasal cavity. As a general rule I feel there is no excuse for massive packing of the nasal cavity except possibly as an emergency measure.

Bleeding from the area between the posterior portion of the middle and superior turbinates on one side and the lateral nasal wall on the other just anterior to the sphenoid sinus may be controlled by using cotton tampons and the antipyrine tannic acid mixture. Two such cases were encountered and were successfully handled in this manner. Woodward and Holt[5] found soluble gauze valuable in the treatment of some cases of epistaxis.

It is sometimes very difficult to localize a bleeding point when the bleeding is very profuse and also when the bleeding has completely stopped. At times, if you are lucky enough to see such a case when the bleeding is only slight or moderate in amount, it is quite a help and, in many cases, the bleeding will vary greatly in amount from time to time. When searching for a bleeding point when the bleeding has temporarily stopped, sometimes a very small nipple shaped elevation may be found. The elevation is almost invariably the site of the break in the involved vessel, and if there is any doubt, the slightest touch on the suspicious point will re-establish the flow of blood.

In four cases the external carotid artery was ligated when other methods failed to control the bleeding. In three of them a deflected septum made it very difficult to use tamponage effectively. Three of the patients were in other cities where they could not be kept under very close observation. They had already bled for a long time, and I felt that it was wise to ligate the external carotid. In all four cases the bleeding was successfully controlled.

The patient's general condition must be observed closely, and whole blood should be given whenever the blood loss has been very great. It may be safer to give small amounts rather frequently than to give 500 or 1,000 cc. at one time.

Other causes of hemorrhage must be kept in mind because cardiovascular hemorrhage may be aggravated by various

abnormalities of the blood and blood clotting mechanisms which should be treated as indicated.

Sedatives and hypnotics may be given, but over-sedation and hypnosis should be avoided because in this state it may be possible for a patient to swallow rather large quantities of blood without being aware of it.

When other methods have been given an adequate trial and fail to control the bleeding, ligation of the external carotid or possibly the internal maxillary artery should be carried out. If cardiovascular hemorrhage should come from the extreme upper anterior portion of the nasal cavity there might arise an indication to ligate the anterior ethmoidal and possibly the posterior ethmoidal artery. This could be carried out through a Jansen-Lynch orbital approach, such as is used in operations on the frontal and ethmoid sinuses.

It is recognized that in cases of severe hypertension and arteriosclerosis, nose bleed may be of temporary benefit; but in many individuals the bleeding continues far too long or recurs too often. The lowering of blood pressure incident to epistaxis is transient and the treatment of the cardiovascular disease should be placed in the hands of an internist.

SUMMARY AND CONCLUSIONS.

Twenty-eight cases of cardiovascular epistaxis have been studied.

They appear to have special characteristics that make this type of hemorrhage a distinct clinical entity.

The most frequent location of the bleeding is in the lateral wall of the inferior meatus far back.

A group or plexus of blood vessels found in the above area is described and the name naso-nasopharyngeal plexus is suggested.

Various methods of arresting cardiovascular epistaxis are discussed and a method of tamponage of the inferior meatus which has usually proved successful is described in detail.

In cases which resist other methods of control, ligation of the external carotid artery is advocated without too much delay.

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THE USE OF RADIUM IN THE MIDDLE EAR FOR SELECTED CASES OF CHRONIC OTITIS MEDIA.*

WILLIAM WESLEY WILKERSON, JR., M.D.;
LEE FARRAR CAYCE, M.D., and JOSEPH McK. IVIE, M.D.,
Nashville, Tenn.

Radiation has been used for many years in the treatment of nasal polypi, keloids, chronically infected ulcers with excess granulation tissue, and indolent ulcers in various areas of the body. With this as a lead, the use of radium as an adjunct to other therapy in aural polypi and cases of chronic otitis media complicated with granulations seemed a worthy experiment.

AURAL POLYPI.

The dearth of material on aural polypi, granulations and fibroma, both in journals and textbooks, indicates their infrequent occurrence.

These complicating processes of otitis media have been classified as one pathological process, varying as to stage of growth. This can be true only in part, as the formation of granulation tissue, under certain conditions. is a healing process.

In his comprehensive article on aural polypi with their morphological changes, Lederer[2] discusses three types: granulation, connective tissue and lymphatic polypi. While the names of the growths suggest the morphological characteristics, it is of interest that in the first two, squamous epithelium prevails, while in lymphatic polypi cylindric epithelium is noted.

*From the Division of Otolaryngology, Vanderbilt Medical School.

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TABLE I. PRECEDING RADIATION.

Name, Age, Sex	Length of Infection	ENT Examination Unusual History	Roentgen Examination of Sinuses	Culture from Middle Ear	Biopsy of Middle Ear Growth	Hearing Loss Before Radiation†	Radiation
Ear No. 1 R. P., female, 36*	34 years	Nasal congestion lt. C.O.M.P. with polyp posteriorly	Frontals, ethmoids and antra slightly cloudy	Hem. strept. Staph. albus. Monilia albicans	Polyp	Mixed deafness, average 45 db.	3 10-minute treatments
Ear No. 2 R. P., female, 36*	34 years	Rt. C.O.M.P. with granulations and fibroma anteriorly. Nasal congestion.	Frontals, ethmoids and antra cloudy	Staph. hem. Strept. Geotrichum. Oidium	Fibroma	Mixed deafness, average 60 db.	4 10-minute treatments
Ear No. 3 B. L. B., male, 9	8 years	Infected tonsils and adenoids. Nares negative. Lt. C.O.M.P. polyp	Negative	Staph. albus. Non-hem. Strept. No fungi	Fibroma	Conduction deafness, average 22 db.	3 5-minute treatments
Ear No. 4 E. M. H., female, 44*	Since childhood	Pus in nares. Lt. C.O.M.P. polyp. Nasal septum deviated	Pansinusitis	Staph. Gram neg. rods. Mold type fungus	Granulation	Mixed deafness, 50 db.	1 5-minute treatment
Ear No. 5 E. M. H., female, 44*	Since childhood	Pus in nares. Nasal septum deviated. Fibroma rt. C.O.M.P.	Pansinusitis	Aspergillus niger. Staph. albus	Fibroma	Mixed deafness, 50 db.	1 5-minute treatment
Ear No. 6 L. D., male, 36	1 year	Nose and throat negative. Poly. rt. C.O.M.P.	Right ethmoid cloudy	Staph. albus	Polyp	Conduction deafness, 10 db.	3 5-minute treatments
Ear No. 7 K. W., female, 19	Since childhood	Nose and throat negative. Polyp lt. C.O.M.P.	Essentially negative	Klebsiella ozaenae. Nonhem. strept.	No biopsy	Record lost	1 5-minute treatment
Ear No. 8 S. W., male, 19	5 months	Nose and throat negative. Pus and granulations right ear. Rt. C.O.M.P. Granulations.	Right maxillary slightly cloudy	Hem. strept.	No biopsy	Conduction deafness, average 15 db.	1 5-minute treatment
Ear No. 9 B. C., female, 14	6 years	T. and A. previously. Adenoids present. Lt. C.O.M.P. Granulations	Negative	Staph. aureus	No biopsy	Conduction deafness, average 40 db.	1 10-minute treatment
Ear No. 10 H. K., male, 23	Since childhood	Pus in nares. Throat negative. Rt. C.O.M.P. Granulations	Maxillaries slightly cloudy	Staph. strept. Mold	No biopsy	Mixed deafness, average 8 db.	1 5-minute, 1 10-minute treatment

*Bilateral. †As measured by audiometer.

We were able, in our small series, to verify Lederer's[2] findings, and to supplement his classification by the addition of fibroma as a more mature polyp. An increase in the connective tissue which is present in all polypi results in fibroma.

In an acute exacerbation of a middle ear infection, there is an increase in the polymorphonuclear leucocytes within all types of aural polypi, together with ulceration and increase in abscess formation within the growth. Since granulation polypi spring from the subepithelium, they are indicative of osseous necrosis. The fact that they seldom originate from the promontory is another indication that this osseous mass is not susceptible to infections.

Tumarkin[4] stresses the importance of conservative treatment for aural polypi, stating that radical surgery is rarely indicated. Besides the use of caustics, he advises unipolar, bipolar and ordinary zinc ionization.

While trite, all papers on this subject should warn surgeons to avoid the evulsion of growths in the middle ear. The reason is self-evident. Biting forceps should cut cleanly and snares function properly to avoid a possible catastrophe. This could occur even in as simple a procedure as removing tissue for biopsy.

While one sees many cases of chronic otitis media, relatively few cases present the picture of new growths within the middle ear; therefore, the series presented in this paper is small—too small for the establishment of conclusive results.

RADIATION.

With no precedent to follow, the dosage and type of radiation for use in the external auditory canal and middle ear had to be established.

In the treatment of the 10 cases listed in this article, the nasopharyngeal radium applicator was used. This applicator consists of approximately 50 mg. of radium contained in a Theringion glass tube 0.27 mm. thick and surrounded by monel metal 0.33 mm. thick. Seventy-five per cent of the hard

beta rays are absorbed. The radium is 2 mm. from the end of the applicator, which is an obvious disadvantage. Further filtration could eliminate practically all the beta rays. Since the nasopharyngeal applicator was available, it was thought advantageous to use it rather than design a new applictor, although that could easily be devised.

It as felt that the ideal dose was that amount of radiation necessary to bring about the desired result without damage to the tissue. It was impossible to estimate that dose using the nasopharyngeal applicator containing 50 mg. of radium, for three reasons: *1.* no similar treatment had been reported with this applicator; *2.* the skin of the external auditory canal being thin, it was thought to be unusually susceptible to radiation reactions; *3.* the question of cartilage damage had to be considered. In order to evaluate a safe dose, a series of normal patients was treated with the applicator inserted into the external auditory canal with doses varying from 30 seconds to 15 minutes. In over 100 control patients, no erythema could be seen after 10 to 15 minutes of treatment; therefore, a maximum dose of 12 minutes was established in all cases. None of the patients has shown any evidence of erythema or skin irritation.

The use of radiation for chronic granulation tissue is well known. The rationale for treatment in the middle ear is the same as that in other parts of the body. The concept that aural polypi, chronic granulation tissue and fibroma are different states of the same process would lead one to assume that if radiation is beneficial in one stage, it might be in another. McKee and Cipollaro[3] state, "The effect of radiation is closely related to the degree of leucocytic infiltration, the rate of cellular hyperplasia, the known sensitiveness of lymphocytes and the degree of proliferation of connective tissue." Desjardin's[1] classical work on the sensitiveness of different tissues has enabled us to predict with some accuracy the reaction to be expected. In chronic granulation, the radiation undoubtedly affects the leucocytic infiltration and the cellular hyperplasia just as it does in other parts of the body.

TABLE II. FOLLOWING RADIATION.

Name, Age, Sex	Elapsed Time Since Last Treatment	Secretion of Middle Ear	Growth of Middle Ear	Hearing Loss	End-Result
Ear No. 1 R. P., 36, female	1 year	Dry	Totally absent	Mixed deafness, average 30 db.	Excellent
Ear No. 2 R. P., 36, female	1 year	Dry	Totally absent	Mixed deafness, 30 db.	Excellent
Ear No. 3 B. L. B., 9, male	8 months	Drainage continues	Much smaller	Conduction deafness, 7 db.	Poor
Ear No. 4 E. M. H., 44, female	9 months	Slight drainage	Lining membrane appears normal	Mixed deafness, .0 db.	Good
Ear No. 5 E. M. H., female	6 months	Moderate drainage	Totally absent	Mixed deafness, 35 db.	Good
Ear No. 6 L. D., 36, male	9 months	Dry	Totally absent	Conduction deafness, .0 db.	Good
Ear No. 7 K. W., 19, female	8 months	Profuse drainage	Slightly smaller	Record lost	Poor
Ear No. 8 S. W., 19, male	No follow-up	No follow-up	No follow-up	No follow-up	No follow-up
Ear No. 9 B. C., 14, female	15 months	Drainage continues	Granulations absent—lining membrane thickened	Conduction deafness, 40 db.	Good
Ear No. 10 H. K., 23, male	4 years	Dry	Lining membrane practically normal	Mixed deafness, average 5 db.	Excellent

Excellent—denotes a dry ear, with complete disappearance of growth.

Good—denotes a moist ear, with complete disappearance of growth.

Poor—denotes growth still present, with draainage.

TREATMENT.

The polypi and fibromas were removed surgically as completely as possible, which allowed the insertion of the applicator to the base of the polyp or the fibroma. Radiation was applied to the base of the lesion three to six days later when the young, sensitive fibroblasts were more active. This was similar to the effective treatment of keloids or polypi in other parts of the body.

With the patient in a reclining position and the diseased ear exposed, the external auditory canal and the middle ear were thoroughly cleansed. The radium applicator was then passed through the external auditory canal into the middle ear adjacent to the growth. The applicator was held in place by the use of cotton packed into the external auditory canal and auricle.

Audiographs of each patient were taken before and after radiation therapy. Cultures and biopsies of the middle ear secretions and tissue were made when feasible. A Roentgenogram of the paranasal sinuses was made, and of the mastoids, when indicated.

No patient, after a treatment, was given subsequent radiation until 30 days had elapsed.

The tables give complete information in a concise manner in each of these cases. A total of 10 ears is reported. In addition to the cases listed in the tables, we have used radiation with the 50 mg. radium applicator for the removal of granulation tissue in the middle ear following two endaural radical mastoidectomies and one simple mastoidectomy with excellent results.

CONCLUSIONS.

1. Fifty mg. of radium as shielded in the nasopharyngeal applicator can be safely used in the middle ear.

2. This therapy is correlated with radiation of similar tissues in other parts of the body.

3. In the two cases whose end-results were classified as poor, the growths, after treatment, showed definite evidence of atrophy.

4. The effect of radiation on the infection undoubtedly played some part in healing these lesions.

5. The results, even in this small series of cases, are indicative of the merits and rationale of radiation in selected cases of middle ear disease.

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IRRADIATION THERAPY OF FENESTRATION AND RADICAL MASTOIDECTOMY CAVITIES.*

G. O'NEIL PROUD, M.D., and THEODORE E. WALSH, M.D.,
St. Louis, Mo.

One of the most troublesome phenomena which confronts the otologist is the appearance and persistence of granulation tissue and discharge in the postoperative radical mastoidectomy or fenestration cavity. There is little doubt that the endaural approach, magnification technique, and application of skin graft to the cavity have enabled the aurist to do a much more thorough exenteration of the diseased bone, and a dry, well epithelialized cavity is more easily obtained. Nevertheless, granulations do form in some cases. Meticulous postoperative cleansing, curettement of granulations, cautery and antiseptic drops or powders are frequently sufficient to produce a dry cavity, but some cavities continue to form granulations and discharge persists in spite of these measures.

It is the purpose of this paper to present the evaluation of another procedure, Radium Irradiation Therapy, as an adjunct to the older methods of postoperative care.

Other investigators have advocated the use of irradiation in troublesome postoperative cavities. Goosman[1] reported 10 cases and Ersner and Weiner[2] 15 cases successfully treated with X-ray when ordinary therapy failed to rid radical mastoid cavities of granulations and discharge. Keeler[3] advised the use of radium and reported success in three cases.

*From the Department of Oto-Laryngology of the Washington University School of Medicine, St. Louis, Mo.

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SELECTION OF CASES.

All postoperative fenestration and radical mastoidectomy cases which exhibited discharge and excessive granulations in the cavities were seen biweekly and received the following regimen:

1. Careful dry wipes.
2. Removal of exuberant granulations with the curette.
3. Cauterization of small granulations with a concentrated solution of trichloracetic acid.
4. Insufflation of boric acid powder or a combination of zinc peroxide, sufanilamide and sulfathiazole powders.
5. Instruction to the patient to instill a solution of 5 per cent boric acid in 70 per cent alcohol into the ear twice daily.

Thirty cases, 17 radical mastoidectomies and 13 fenestrations, which did not respond to this therapy were chosen for irradiation. When radium treatments were started the above measures were discontinued.

MATERIAL AND TECHNIQUE.

The irradiation was given with the standard 50 mgm. radium sulfate applicator as described by others[4-8] for use in the irradiation of nasopharyngeal lymphoid tissue. The cavity was carefully dry wiped with cotton applicators and the radium applicator was then placed in contact with the area of granulation tissue and left in position for 12 minutes. Three such treatments were given at weekly intervals and the patients were observed one week, two weeks, one month, and two months after the third treatment.

RESULTS.

The value of the therapy was estimated as follows: *1.* Good; complete disappearance of all granulation tissue, and cessation of discharge. *2.* Fair; partial disappearance of granulations, and complete cessation of discharge or complete

disappearance of granulations with diminution of discharge. *3*. The result was recorded as poor when granulations and discharge were unchanged.

TABLE 1.

Case No.	Type of Procedure Done Prior to Irradiation	Length of Time Between Surgery and Irradiation	Result
1	Three simple Mastoidectomies and two Radical Mastoidectomies	One year, nine months	Good
2	Radical Mastoidectomy	Eight months	Good
3	Fenestration	One year	Good
4	Radical Mastoidectomy	Fourteen months	Good
5	Fenestration	Eleven months	Good
6	Fenestration	Two years, three months	Good
7	Radical Mastoidectomy	Eighteen months	Good
8	Radical Mastoidectomy	One year	Fair
9	Fenestration, Bilateral	Seven months	Fair
10	Fenestration	Two years, three months	Fair
11	Fenestration and Revision	One year	Good
12	Fenestration	Eighteen months	Good
13	Radical Mastoidectomy	Six months	Fair
14	Radical Mastoidectomy	Seventeen months	Poor
15	Fenestration	Two years, nine months	Fair
16	Radical Mastoidectomy	Nine months	Fair
17	Radical Mastoidectomy	Fourteen months	Good
18	Radical Mastoidectomy	Seven months	Poor
19	Fenestration	One month	Good
20	Fenestration	Three months	Good
21	Radical Mastoidectomy	Ten months	Poor
22	Radical Mastoidectomy	Fourteen months	Good
23	Radical Mastoidectomy	Two years	Poor
24	Fenestration	Eleven months	Good
25	Radical Mastoidectomy	Three years	Fair
26	Fenestration	One year	Good
27	Radical Mastoidectomy	Four months	Poor
28	Radical Mastoidectomy	Three months	Good
29	Radical Mastoidectomy	Two years	Good
30	Fenestration	Thirteen months	Fair

The individual cases were summarized as follows:

TABLE 2. TOTALS.

Procedure	Number	Good	Fair	Poor
Radical Mastoidectomy	17	8	4	5
Fenestration	13	9	4	0
Total	30	17	8	5

DISCUSSION.

It is interesting to note that the response to radium was slightly better in the fenestration cases. It is felt that the osteitis in the cases of radical mastoidectomies might account for the relatively larger number of failures or partial successes. From Table 1 it is evident that the length of time which the granulations and discharges had been present had little to do with the response to irradiation. One case did not respond although it was only of four months' duration, while another responded very satisfactorily after a duration of 21 months. No untoward results were noted following experimental therapy. There was no deterioration of hearing following radiation. Naturally, one is curious as to why the cases show improvement subsequent to irradiation. Three possibilities present themselves:

1. The irradiation exerts a specific destructive influence upon the granulation tissue.

2. The infection in the cavity is eradicated in some way by the irradiation, and the disappearance of the granulations is a secondary phenomenon.

3. The irradiation is both bactericidal and destructive to the granulations.

It is well known that tissues which are poorly differentiated and embryonic in type respond more readily to irradiation than do more highly differentiated tissues. It would follow

that granulation tissue, which consists mostly of young fibroblasts and capillaries, should be quite radiosensitive.

Three observers[9] have produced convincing evidence that radium emanations exhibit a definite bactericidal effect *in vitro*. The reasons for this effect have received much discussion. Two theories have been proposd to explain the lethal action of radioactive rays on *in vitro* cultures of streptococcus and staphylococcus: the chemical hypothesis states that the death of the cells is due to chemical changes within the cell set off by contact of the radioactive emanations with intracellular substances; the second theory is known as the "lethal mutant theory" and holds that death of the bacteria is due to mutation produced within the cell following irradiation. In support of this theory is the fact that the irradiated cell usually lives and undergoes division. Each of the new formed cells, however, promptly dies. Spencer[10] feels that the beta ray is the one which is lethal to the bacteria.

The possibility that the irradiation is both destructive and bactericidal is but conjecture. In any event, improvement occurred in 25 out of 30 cases in this series, and since the nasopharyngeal radium applicator is now available to many otologists, its use in stubborn cases is warranted; however, the use of radium should be reserved for only those cases which do not respond to ordinary office care.

SUMMARY.

1. Some radical mastoidectomy and fenestration cavities continue to fill with excessive granulation tissue and discharge in spite of the most meticulous postoperative care.

2. The use of the nasopharyngeal radium applicator in such cavities is helpful in some instances.

3. The results of radium treatment of excessive granulation tissue and discharge in 30 fenestration and postoperative radical mastoidectomy cases are presented.

4. Reasons for success and failure are discussed.

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THE EFFECTIVENESS OF DRAMAMINE IN RELIEVING THE VESTIBULAR REACTIONS FOLLOWING THE LABYRINTHINE FENESTRATION OPERATION.*

EDWARD H. CAMPBELL, M.D.,
Philadelphia, Pa.

In the April 8, 1949, issue of *Science* there appeared two articles on the use of a new antihistamine drug, Dramamine brand of dimenhydrinate, in the prevention and treatment of seasickness or motion sickness which has stimulated a great deal of interest and has suggested the possibility of expanding the usefulness of this drug to a variety of conditions. Gay and Carliner[1] reported the results of a thoroughly controlled investigation of the use of Dramamine, first on the personnel aboard the U.S.S. America during the summer of 1948, and a few months later on the personnel on board the troop transport U.S.A.T. General C. C. Ballou. On board the troop transport there were 1,366 men, and of these, during the short voyage in rough weather, there were 319 cases of seasickness treated with Dramamine. Complete relief was obtained in 311, or 97.4 per cent. The authors concluded that "the accumulated data indicate that Dramamine is a powerful nontoxic, prophylactic and therapeutic drug, which can be used to control the symptoms of seasickness."

In a preliminary study, Strickland and Hahn[2] reported the effectiveness of the drug in the control of airsickness. Their tests were conducted at the School of Aviation Medicine at Randolph Field, Tex., and 216 subjects were used. One-half

*From the Department of Otolaryngology of the Graduate School of Medicine of the University of Pennsylvania.

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of them received Dramamine and the other half a placebo. Of those given Dramamine, 28.7 per cent became ill as opposed to 55.6 per cent among those given a placebo. These tests appeared to indicate that the drug decreased the incidence of airsickness.

The chemical and pharmacological properties of the drug Dramamine have been reported by its manufacturer.* Chemically, it is B-dimethylaminoethyl benzohydryl ether 8-cholorotheophyllinate. It is relatively insoluble in water. A transient fall of blood pressure of 29 to 56 per cent has been noted when large doses (3 to 12 mg. per kg. of body weight) were administered intravenously to cats and a brief stimulation of respiration was observed. It was found that the drug has considerable antihistaminic potency in guinea pigs at a dosage of 1.5 mg. per kg. Acute and chronic toxicity of Dramamine was determined by administering it to rats and mice. Subsequent studies of the tissue of the heart, liver, kidneys and brain showed no pathologic changes. Gay and Carliner[1] found no unpleasant symptoms develop from the drug in the administration of it to over 300 men.

In personal communications with Dr. L. N. Gay regarding the use of Dramamine it occurred to both of us that it might also be effective in relieving or preventing the vertigo, nausea and vomiting of pathologic conditions of the vestibular apparatus such as Ménière's disease and the reactions following the labyrinth fenestration operation for otosclerosis. Consequently, the drug was used by the author in a series of 28 patients who received the fenestration operation in 1949. The following report deals with the effectiveness of the drug in such operated cases:

In order to properly evaluate the effects of Dramamine on patients who have received the fenestration operation it is necessary to establish a standard of the reactions these patients normally experience following the operation. These postoperative reactions are somewhat different in dif-

*G. D. Searle and Co., Chicago, Ill.

ferent operative clinics, depending to some extent upon the amount and type of preliminary medication, the anesthetic used through the operation, the operative technique itself and the postoperative care and medication. Some operators claim but little postoperative vertigo and vomiting, while others observe a considerable amount lasting a variable length of time. Those patients who receive considerable preoperative sedation with barbiturates and morphine or demerol and a local anesthetic for the operation are apt to show less nausea and vomiting during the day following operation than those patients who receive a relatively light preoperative sedation followed by light nitrous oxide and oxygen or intravenous anesthesia through the operative procedure. The former patients, as a rule, sleep soundly through the day because of the depressing action of the hypnotic and sedative drugs, while the latter group arouse rather promptly from their light preoperative sedation and mild general anesthesia, and their alert mental processes register more quickly and profoundly the effects of such a disturbance of their equilibrium mechanism.

In addition to the amount and type of preoperative sedation and the operative anesthesia, the postoperative vertigo, nausea and vomiting are influenced to some extent by the technique of the operation itself. The degree of serous labyrinthitis that may develop after the operation is dependent to some degree at least upon the amount of trauma to which the membranous labyrinth is subjected during the creation of the fenestra in the surgical dome of the vestibule. Those surgeons who use considerable douching of the field and manipulation of the fenestra during its creation should expect more traumatic labyrinthitis after the operation than should those surgeons who make the fenestra with little douching of the labyrinthine area and no manipulation of the endolymphatic labyrinth.

The postoperative reaction is also influenced by certain factors in the immediate postoperative care such as the position of the patient, administration of drugs and the use of intra-

venous fluids. After operation the position that is most comfortable for the patient and least conducive to vertigo and nausea is the flat position on the side opposite the one operated upon. The routine administration of 2 000 cc. of glucose and saline solution intravenously by the slow drip process starting immediately after operation further tends to lessen the equilibrium disturbance. The choice of sedatives used postoperatively may also influence the nausea. Morphine may aggravate the reaction, and individual idiosyncrasies to certain drugs may be present. Some surgeons use certain special drugs which are thought to exert a favorable influence on postoperative nausea.

In all patients subjected to the fenestration operation it is to be expected that they will experience some degree of postoperative vertigo, nausea and vomiting because of the opening of the vestibular mechanism. There is a variation in the degree of sensitivity of the equilibrium apparatus of different persons so that one may naturally experience a profound postoperative vertigo reaction and another, with a less sensitive mechansm, may have but little equilibrium disturbance. The average operated patient, however, will experience considerable vertigo, nausea and vomiting with considerable, often violent, nystagmus in spite of such relieving influences as proper position, intravenous fluids and ordinary medication.

In order to evaluate properly the effect of any special medication on the postoperative vertigo, nausea and vomiting of patients subjected to the labyrinth fenestration operation it is necessary to establish a standard of such reactions that would normally occur without such special medication. Such a standard of reactions is believed to have been set up by the author in the careful postoperative observation of a large number of fenestrated patients who have received identical preoperative medication, practically identical operative anesthesia, the same operative technique and exactly the same postoperative care.

The preoperative medication has consisted of three grains of nembutal 10 hours before operation, three additional grains of nembutal one and one-half hours before operation and a hypodermic injection, one-half hour before operation, of one-quarter grain of morphine sulphate and 1/150th grain of scopolamine. The operative anesthesia in practically all cases has consisted of light nitrous oxide and oxygen inhalation throughout and local infiltration of the operative area with 1 per cent procaine solution containing a few drops of adrenalin. In an occasional case the anesthesia has been supplemented by a small amount of sodium pentothal intravenously or a very small amount of ether. The operative technique has been essentially the one described by Lempert with a few minor changes. The fenestra has been created with as little saline douching of the area and as little manipulation of the membranous labyrinth as is consistent with thorough removal of endosteal remnants and bone chips. In all cases the tympanomeatal flap has been sealed firmly in position by either small rolls of paraffin mesh gauze or small pieces of cellulose sponge. The postoperative care consists in the placing of the patient in the recumbent position or on the side opposite the ear operated, the administration of 2,000 cc. of 5 per cent glucose and normal saline solution intravenously over a period of about nine hours and the administration of one grain of codeine sulfate hypodermically as needed for discomfort. It is seldom that the codeine is required during the first 12 hours after operation. Within two hours after operation the patients have aroused sufficiently from their preoperative medication and anesthesia to become fairly alert and to seek the most comfortable position in bed and inquire about the operation.

Under the conditions as outlined above, the postoperative reactions have been surprisingly uniform and can be standardized as follows:

On the day of operation (operation finished at approximately 10:30 A.M.), the patient suffers extreme vertigo and nausea, he prefers the position on the side opposite the oper-

ated ear with his eyes closed and vomits frequently through the day spontaneously and practically always when disturbed. He refuses all food and only the occasional patient can retain water by mouth. As soon as the patient recovers from the influence of the preoperative sedation and the anesthetic (about two to three hours after completion of the operation), severe nystagmus can be observed, often violent in degree. During the evening of the first day the patient's vertigo and nausea are somewhat improved but the vertigo continues to be severe and vomiting is apt to occur several times. On the following day, the vertigo, nausea and vomiting are somewhat reduced but the average patient will continue to have severe vertigo and will move in bed as little as possible to avoid severe nausea and vomiting. The nystagmus continues to be exaggerated. Approximately half the patients, on this day, are unable to retain sufficient water by mouth to meet liquid requirements and a second intravenous infusion of 2,000 cc. of glucose and saline is necessary. The other half retain, with difficulty, sufficient water by mouth during the day, but vomit two to six times. Only the occasional patient can take liquid diet with no vomiting and rarely does a patient wish to have his head elevated. On the next day, 48 hours after operation, the vertigo and nausea have subsided sufficiently to permit some elevation of the head and the retention of liquid diet and occasionally soft diet. Vertigo of a moderate degree, however, is still present and only an occasional patient will wish to sit up in bed and move freely. Nystagmus is still present to a moderate degree. On the following day the patient is out of bed (with help) for the first time and may take a few steps from the bed to a chair. Soft diet is then taken and although there is moderate vertigo still present, there is little or no vomiting. Thereafter the patient moves around gradually, and is able to take care of himself sufficiently at the end of six or seven days after operation to be discharged from the hospital.

Considering the severe equilibrium disturbances which these patients undergo, causing three or more days of acute

discomfort, it is only natural that medicinal agents that might offer any hope of relief would be tried. Noting the effect which the drug Dramamine had on patients suffering with seasickness, as recorded by Gay and Carliner,[1] it was thought the drug would have a similarly helpful effect on the very similar symptoms occurring after the labyrinth fenestration operation. The drug was tried, therefore, in a series of 28 patients who received the fenestration operation under exactly the conditions as outlined above.

The Dramamine administered was in the form of tablets, each containing 100 mg. of the drug. In nearly all the cases the tablets were given by mouth, but in the later cases, because of the fact that sometimes the first and second doses were vomited, the first two doses were given per rectum. The general plan of administration was to give the first dose consisting of two tablets (200 mg.) immediately after the patient was returned to bed from the operating room (between 11 and 11:30 A.M.) and the subsequent doses (each 100 mg.) were given at three-hour intervals for four doses, making a total of 600 mg. on the day of operation. The last dose was given at approximately 11:30 P.M. and at that time a hypodermic injection of 1 gr. of codeine was given and the patient not disturbed through the remainder of the night. On the next day one tablet of Dramamine (100 mg.) was given by mouth every three hours for six doses, starting at 8 A.M. The administration of the drug was not resumed on the third or subsequent days unless the vertigo became worse again, and this occurred only in a few instances. In the later operated cases the first dose of Dramamine and occasionally the second dose were given per rectum and certain advantages of this method over the oral route were found. For the first dose the two tablets of Dramamine were crumbled up in 15 or 20 cc. of water and injected into the rectum through a small syringe. After the first or second dose of the drug had been given, there was no difficulty in giving the subsequent doses by mouth as the patient by that time had become sufficiently alert to cooperate and in practically all cases could retain the tablet without vomiting.

The postoperative care of these 28 patients who were given Dramamine was exactly the same as given the numerous patients who were operated previously and whose reactions serve as a standard of comparison. The 2,000 cc. of 5 per cent glucose and saline solution was routinely given intravenously and the patient permitted to take the position in which he was most comfortable.

The effect of the Dramamine in controlling the vertigo, nausea and vomiting of these 28 operated cases is recorded in Table 1.

COMMENT.

Observation of the postoperative reactions of these 28 patients who received Dramamine following the fenestration operation indicates that all of them were relieved of the vertigo, nausea and vomiting to a large extent. Some of them were sufficiently improved so that they could leave their beds on the day after operation, could drink liquids freely and could take soft diet. Others, while comfortable in a quiet position, became moderately dizzy on movement and preferred to stay in bed for another day. In none of the 28 patients was there any vomiting on the day following the operation or on subsequent days, although there was some nausea in a few of the patients.

It was noted that the nystagmus present in the patients usually closely paralleled the nausea and vomiting — that is, when marked nystagmus was present the nausea was severe and vomiting might be frequent; however, it was observed also that in several of the patients some nystagmus persisted for several days without the amount of vertigo and nausea that one usually associates with such a degree of nystagmus.

In general, the relief of the postoperative symptoms by the use of the drug was not as great on the day of operation as on the following day as compared with operated patients who did not receive Dramamine. In the latter group, on the day after operation, there was, as an average, considerable nausea

and some vomiting, while in the group who received Dramamine there was only slight nausea and no vomiting. Greater relief on the day of operation might perhaps have been anticipated in the group receiving the drug, considering the rather large dosage given in a comparatively short time. In some cases the first dose of 200 mg. was lost or partly lost as the result of vomiting; however, in those patients who received the first two tablets by rectum there was, on the whole, no more relief of the symptoms than in those patients who were given the drug by mouth. If it were possible to modify the drug so it could be used by hypodermic injection, a more efficient and consistent result might be anticipated.

In only one patient was the Dramamine given as a prophylactic and this patient did not show less vertigo and nausea than the general average of the cases who did not receive the drug until after the operation. It may be possible that the hypnotic and sedative drugs given before operation have some antagonistic effect on the Dramamine to lessen or delay its action. The author intends to use the drug as a prophylactic with and without preoperative sedation and with various hypnotics and sedatives, in another series of cases, to note any change in the postoperative relief of nausea and vomiting.

The prompt beneficial effect of the drug was particularly noticeable in those patients who showed relapses a day or two after the tablets had been discontinued. The vertigo and nausea of these patients promptly subsided when the Dramamine was again given, often within an hour after the first tablet was swallowed. Several of the patients asked that the tablets be continued regularly to prevent vertigo and nausea.

A rather surprising feature, in the observation of these cases, was the fact that in nearly all cases there was no recurrence of the vertigo and nausea on the day following the discontinuance of the Dramamine. In the average case not given the drug after operation there is moderate vertigo and some nausea on the third and even fourth days. In these 28 cases the Dramamine was given only on the day of operation and on the following day. It might be thought that the

action of the drug would be worn off by the third day and the patient return to the state of moderate vertigo and nausea that the average untreated patient experienced. This was found not to be the case, however, as the great majority of the treated patients did not experience near the vertigo and nausea on the third and subsequent days as did the untreated cases.

Close observation on the degree of drowsiness the treated patients experienced was not made. The impression is gained, however, that this antihistamine drug caused little or no drowsiness. It is my custom in all the fenestration cases to give routinely for three or four days a mild to moderate dose of a hypnotic each night at bed time and a hypodermic of codeine as needed for discomfort. The patients, therefore, have some reason to be drowsy at times from the effects of these drugs. It can be stated that the depression and drowsiness of the treated patients was certainly no greater than in the untreated patients and it is my impression that the treated patients were more alert than the others on the day following operation, largely perhaps because they were less dizzy and nauseated.

TABLE 2.

Summary of the Effectiveness of Dramamine in Relieving the Postoperative Vertigo, Nausea and Vomiting of Fenestrated Patients.

Number of patients treated with Dramamine	28
Number of patients markedly relieved	8
Number of patients considerably relieved	9
Number of patients moderately relieved	11
Number of relapses after Dramamine was discontinued	8
Number of relapses fully relieved by further administration of Dramamine	8

CONCLUSIONS.

In the observation of these 28 patients who received Dramamine on the first two days following the labyrinth fenestration operation it was noted that a moderate improvement of the postoperative vertigo, nausea and vomiting resulted on

the day of operation and that a considerable lessening of those symptoms occurred on the day after operation over the severe vertigo, nausea and vomiting of fenestrated patients who did not receive the drug. The treated patients were able to go back to a normal diet approximately two days sooner than the untreated cases, could become physically active much sooner and, when they desired, were able to be discharged from the hospital one or two days earlier. Considering the small number of patients observed, the features recorded are impressions rather than dogmatic conclusions and further observation of numerous cases will be necessary to establish definite facts on the effectiveness of the drug on fenestrated cases. Its use will be continued in other series of cases, both as a prophylactic and therapeutic agent, administered in a variety of ways and coincidently with the various hypnotics and sedatives commonly used preoperatively in patients undergoing the fenestration operation.

SUMMARY.

1. Recent reports of the effectiveness of Dramamine in controlling seasickness and airsickness have suggested the possibility of relieving or preventing the vertigo, nausea and vomiting experienced by patients who have undergone the labyrinth fenestration operation for otosclerosis.

2. A standard of the degree of such postoperative symptoms has been established in the observations of the reactions of a large number of fenestrated patients.

3. The postoperative vertigo, nausea and vomiting of 28 fenestrated patients who were given Dramamine during the day of operation and the day following were carefully observed and compared with the established normal reactions of untreated fenestrated patients.

4. These observations have shown that the Dramamine treated patients experienced a moderate reduction of the postoperative symptoms on the day of operation over the un-

treated patients and a considerable lessening of these symptoms on the day following operation.

5. A chart has been prepared showing the degree of vertigo, nausea, vomiting and nystagmus of the 28 fenestrated patients treated with Dramamine, on the day of operation, on the day following operation and subsequently. These reactions are shown in comparson with those of untreated patients.

6. Comments and impressions are recorded from the observations made on this series of operated cases.

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269 South 19th Street.

TABLE 1. DATA SHOWING THE POSTOPERATIVE REACTIONS NORMALLY ANTICIPATED IN PATIENTS SUBJECTED TO THE LABYRINTH FENESTRATION OPERATION COMPARED TO THE REACTIONS OBSERVED IN 28 FENESTRATED PATIENTS WHO RECEIVED DRAMAMINE DURING THE FIRST TWO POSTOPERATIVE DAYS.

Patient / Age / Date of Operation	Dramamine Administered Each Tablet 100 Mg. Day of Operation / Day After Operation	Reaction Day of Operation					Reaction Day After Operation					Reaction Subsequently
		Vertigo	Nausea	Vomiting	Nystagmus	Diet	Vertigo	Nausea	Vomiting	Nystagmus	Diet	
Control Average of many operated patients	None	xxxxx	xxxx	Frequent. 6 to 12 times	xxxx	0	xxx	xxx	Moderate. 2 to 6 times	xxx	Water in half the cases	48 hours after operation liquid diet is tolerated. Still much nausea and occasional vomiting. Next day patient can sit up, and out of bed next day. Vertigo still present.
F. T. 26 3-8-49	2 tab. at 11:30 A.M. 1 tab. at 4, 7, 11 P.M. 1 tab. at 8, 11, 2, 5, 8, 11	xxx	xxx	Small amt. One tab. lost	xxx	Water	x	x	0	x	Liquid	Occasional vertigo. No vomiting. Out of bed 2nd day.
B. S. 44 3-15-49	2 tab. at 11:30 A.M. 1 tab. at 4, 8, 12 1 tab. at 8, 11, 2, 5, 8, 11	xxxx	xxx	Small amt. 2 or 3 times	xxxx	0	x	0	0	x	Liquid and soft	Increased vertigo and nausea on 3rd day. Relieved promptly by 4 tab.
W. H. 19 3-21-49	2 tab. at 12 1 tab. at 3, 6, 9, 12 1 tab. at 8, 11, 2, 5, 8, 11	xxxx	xxx	3 times	xxx	0	x	0	0	xx	Liquid and soft	Out of bed day after operation. Only slight vertigo. Full diet on 3rd day.
D. S. 28 3-28-49	2 tab. at 7 A.M. (before op.) 2 tab. at 11 A.M. 1 tab. at 2, 5, 8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xxx	xxx	Once at 11 A.M.	xxx	0	x	x	0	x	Liquid and soft	Out of bed on 2nd day. Some nausea 3rd day relieved by 4 tab. Dramamine.
A. M. 31 3-31-49	2 tab. at 11 1 tab. at 2 (vomited) 1 tab. at 3, 6, 9, 11 1 tab. at 8, 11, 2, 5, 8, 11	xxxx	xxxx	Small amt. 3 times	xxx	0	x	x	0	x	Liquid and soft	No nausea or vomiting. Out of bed 3rd day.
A.A. 36 4-5-49	2 tab. at 11 1 tab. at 1, 3, 6, 9, 12 1 tab. at 8, 11, 2, 5, 8, 11	xx	xx	Once in afternoon	xx	Water	x	0	0	x	Liquid and soft	Only very slight vertigo. Out of bed day after operation.
L. K. 29 4-14-49	2 tab. at 11:30 1 tab. at 2, 5, 8, 11 2 tab. at 8 1 tab. at 11, 5, 2, 8, 11	xxxx	xxxx	3 or 4 times. Some of tablets lost	xxxx	0	x	x	0	x	Liquid and soft	Not observed.
E. A. 36 4-19-49	2 tab. at 11 1 tab. at 2, 5, 8, 11 1 tab. at 8, 11, 2, 5, 11	xxx	xxx	0	xxx	Water	x	x	0	x	Liquid	Only slight vertigo and occasional nausea.
M. M. 41 4-21-49	2 tab. at 11 (vomited) 1 tab. at 2, 5, 8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xxxx	xxxx	Several times	xxxx	0	x	x	0	x	Liquid	Not observed.

E. A. 36 4-19-49	2 tab. at 11 1 tab. at 2, 5, 8, 11 1 tab. at 8, 11, 2, 5, 11	xxx	xxx	0	xxx	Water	x	x	0	x	Liquid	Only slight vertigo and occasional nausea.
M. M. 41 4-21-49	2 tab. at 11 (vomited) 1 tab. at 2, 5, 8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xxxx	xxxx	Several times	xxxx	0	x	x	0	x	Liquid	Not observed.
M. H. 20 4-26-49	2 tab. at 11 1 tab. at 2, 5, 8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xxx	xxx	Twice	xxx	0	xx	xx	0	xx	Liquid	Not observed.
M.S. 22 4-28-49	2 tab. at 11 (vomited) 2 tab. at 12 1 tab. at 3, 6, 9, 12 2 tab. at 8 1 tab. at 11, 2, 5, 8, 11	xxxx	xxxx	3 times	xxxx	0	xx	xx	0	x	Liquid	Some vertigo and nausea on 3rd day. 4 tab. gave relief. 3 tab. given 4th day. No vomiting.
M. D. 33 5-2-49	2 tab. at 11 1 tab. at 2, 5, 8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xxx	xx	Once	xxx	Water	x	x	0	x	Liquid	Slight vertigo. No vomiting. Out of bed on 3rd day.
M. H. 20 5-3-49	2 tab. at 12 1 tab. at 3, 6, 9 1 tab. at 3, 6, 9, 12 P.M.	xxx	xxx	Twice	xxx	0	x	x	0	0	Liquid and soft	Out of bed day after operation. Walking on next day.
J. D. 14 7-6-49	1 tab. at 11 (R) 1 tab. (R) at 2 1 tab. at 5, 8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xxx	xxx	Twice	xxx	Water	xx	xx	0	x	Liquid	Sitting up day after operation. Slight vertigo.
B. H. 38 5-9-49	2 tab. at 12 1 tab. at 3, 6, 9 No tab. day after operation	xxx	xxx	Twice	xxx	0	xx	xx	0	xx	Liquid	Some vertigo and nausea on 3rd day. 4 tab. given with relief.
J. B. 33 5-10-49	2 tab. at 11 1 tab. at 2, 5, 8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xx	xx	0	xx	Liquid	x	0	0	x	Liquid and soft	Only very slight vertigo. Out of bed day after operation.
M. J. 30 5-16-49	2 tab. at 11 1 tab. at 2, 5, 8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xxx	xx	0	xxx	Water	x	x	0	x	Liquid and soft	Out of bed on 3rd day. Slight vertigo and occasional mild nausea.
A. H. 51 5-24-49	2 tab. at 12 1 tab. at 3, 6, 9, 12 1 tab. at 8, 11, 2, 5, 8, 11	xxx	xxx	Twice	xxx	0	xx	x	0	x	Liquid and soft	Increased vertigo and nausea on 3rd day. Relieved with 4 tab.
H. P. 57 6-8-49	2 tab. at 11 (R) 1 tab. at 2, 5, 8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xxxx	xxxx	Small amt. 3 or 4 times	xxx	0	xx	x	0	x	Liquid	Slight vertigo and nausea. Out of bed on 3rd day. No vomiting.

H. P. 57 6-2-49	2 tab. at 11 (R) 1 tab. at 2, 5, 8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xxxx	xxxx	Small amt. 3 or 4 times	xxx	0	xx	x	0	x	Liquid	Slight vertigo and nausea. Out of bed on 3rd day. No vomiting.
J. J. 20 6-7-49	2 tab. at 11:30 (R) 1 tab. (R) at 3 1 tab. at 6, 9, 12 1 tab. at 8, 11, 2, 5, 8, 11	xxxx	xxxx	Twice	xxx	0	xx	x	0	x	Liquid and soft	Vertigo and nausea increased on 3rd day. Out of bed 4th day.
A. B. 23 6-9-49	2 tab. (R) at 11:30 2 tab. (R) at 3 1 tab. at 6, 9, 12 1 tab. at 8, 11, 2, 5, 8, 11	xxx	xxx	2 or 3 times	xxx	Water	x	0	0	x	Liquid and soft	Sitting up day after operation. Slight vertigo. No nausea. Out of bed 2nd day.
L. Y. 36 6-10-49	2 tab. (R) at 11 1 tab. (R) at 2 1 tab. at 5, 8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xxx	xxx	Small amt. twice	xxx	0	x	0	0	x	Soft	Ate large breakfast 24 hours after operation. Increased vertigo and nausea on 3rd day.
G. S. 31 6-13-49	2 tab. (R) at 11 1 tab. at 2, 5, 8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xxx	xxx	Small amt. once	xxx	0	xx	x	0	xx	Liquid	Slight vertigo. No nausea. Out of bed on 3rd day.
R. S. 31 6-16-49	2 tab. (R) at 11 1 tab. (R) at 2 1 tab. at 5, 8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xxx	xxx	Once	xxx	0	x	0	0	x	Liquid and soft	Out of bed day after operation. Full diet next day.
H. S. 29 6-17-49	2 tab. at 11 1 tab. at 2, 5,8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xx	xx	0	xx	Water	x	0	0	x	Liquid and soft	Sitting up and ate large breakfast 24 hours after operation. Full diet next day. Increased nausea and vertigo on 3rd and 4th day, relieved by 2 tab. each day.
M. D. 25 6-20-49	2 tab. (R) at 11:30 1 tab. at 2, 5, 8, 11 1 tab. at 8, 11, 2, 5, 8, 11	xxx	xxx	Small amt. 3 times	xxx	0	xx	x	0	xx	Liquid	Out of bed 48 hours after operation. Only slight vertigo. No nausea.
J. K. 50 6-21-49	2 tab. (R) at 11:30 1 tab. (R) at 2:30 1 tab. at 6, 9, 12 1 tab. at 8, 11, 2, 5, 8, 11	xxx	xxx	Small amt. once or twice	xxx	0	xx	x	0	x	Liquid and soft	Sitting up day after operation. Out of bed next day. Slight vertigo. No nausea.
S. M. 21 6-22-49	2 tab. (R) at 11:30 1 tab. (R) at 2:30 1 tab. at 6, 9, 12 1 tab. at 8, 11, 2, 5, 8, 11	xxxx	xxxx	Once	xxx	0	xxx	xx	0	x	Liquid	Sitting up on 2nd day. Out of bed next day. No nausea.

x = very slight
xx = slight
xxx = moderate
xxxx = severe
xxxxx = very severe
mg = milligram
0 = absent
R = per rectum
tab. = tablet

IDIOPATHIC SUPRAORBITAL NEURALGIA.

T. E. BEYER, M.D.,
Denver, Colo.

Idiopathic supraorbital neuralgia is not a rare condition. It is a disease of adult life, males being more often affected than females. There is apparently no seasonal influence. Noteworthy is the fact that many patients give a history of having been treated at intervals for sinus disease.

Idiopathic supraorbital neuralgia, by definition, has no demonstrable etiology. One may postulate that exposure to cold induces a neuritis and swelling within the supraorbital notch just as thermal changes affect the facial because of its exposed position; however, this is a presumption only which requires more proof before being generally accepted.

The cardinal symptom of idiopathic supraorbital neuralgia is pain referred along the terminal ramifications of the ophthalmic branches of the trigeminal. This pain is often sharp, twinging and intermittent, usually unilateral, and followed at intervals by a dull throbbing headache. In contrast to the pain observed in acute sinusitis, which appears in the forenoon and usually lasts only a few hours, the pain in idiopathic supraorbital neuralgia may continue all day without respite. The "trigger zones" of tic douloureux cannot be elicited.

The second distinctive symptom of idiopathic supraorbital neuralgia is tenderness of the supraorbital and frontal nerves. In the absence of other diagnostic criteria accountable for

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pain along the distribution of these nerves, this sign alone is pathognomonic.

In evaluating this sign it must be remembered that the normal nerves are almost insensitive to pressure. In fact, in most instances they can be rolled under the thumbnail at will. In contrast, the swollen and inflamed nerve is exquisitely sensitive. Even the slightest pressure may cause the patient to literally jump out of the chair with pain.

A further precaution is not to confuse hyperesthesia of the nerves in the supraorbital area with the bone pain that characterizes frontal sinus disease. In the latter the point of tenderness is confined to a small area on the floor of the sinus, below the supraorbital rim, directly above the inner canthus of the eye.

The diagnosis of idiopathic supraorbital neuralgia is not difficult. The most common error is to confound it with acute sinusitis. This is excusable as both disease entities may present the same syndrome, hyperesthesia, and pain limited to the distribution of the peripheral nerves supplying the frontal area; however, careful rhinological examination and X-rays should obviate such mistakes. In doubtful cases several days of observation will divulge the correct diagnosis.

The treatment of idiopathic supraorbital neuralgia by alcohol injection is simple and uniformly efficacious. The injection is best made with a five-eighths inch, 25 gauge needle fitted to a 2 cc. syringe.

The hands of the operator and site of injection having been thoroughly sterilized, the right nerve is firmly fixed at the notch with the thumbnail of the left hand. The needle is then slid along the surface of the nail through the skin and subcutaneous tissue until it strikes the nerve. Instant excruciating pain attests that the point of the needle has penetrated the nerve substance. This must be followed at once by the injection of three to five drops of absolute alcohol.

It is of the utmost importance that the nerve structure be infiltrated with alcohol. Injections made alongside are of little

avail; furthermore, the preliminary injection of novocaine increases the difficulty of locating the nerve and is, therefore, contraindicated.

In many cases the frontal branch lying nearer to the midline must be injected in a similar manner, but it has never been found necessary to cut down upon and resect a portion of the nerve.

Alcohol infiltration of nerve tissue is a momentary painful experience. Fortunately, it is followed almost immediately by a feeling of numbness which extends over the parietal region to the occiput. Palpation proves that the nerve has lost its sensitiveness. The patient is quite relieved of pain.

A late effect of alcohol nerve injection is often an extreme, alarming swelling of the upper lid. The eye may be closed for several days but untoward complications have never been noted.

SUMMARY AND CONCLUSIONS.

Idiopathic supraorbital neuralgia is a common disease entity which may closely simulate acute sinus disease.

Pathognomonic is the hyperesthesia of the supraorbital and frontal nerves.

In the absence of signs and symptoms indicative of sinus disease, this sign alone suffices to make the diagnosis.

Alcohol injection is a simple and safe procedure, welcomed especially by patients who have been treated at length for sinus disease.

227 16th Street.

RECURRENT PNEUMOCOCCUS MENINGITIS. REPORT OF A CASE.*

MORRIS DAVIDSON, M.D., and ARTHUR M. ALDEN, M.D.,
St. Louis, Mo.

Prior to the advent of the sulfonamide compounds, the mortality rate from pneumococcic meningitis approached 100 per cent. Finland,[1] *et al.*, reported 99 cases of pneumococcic meningitis occurring at the Boston City Hospital from November, 1929, to June, 1936, with no recoveries.

Following the introduction of the sulfonamide drugs to general use, numerous cases of recovery have been reported.[2,3] In addition, several instances of recurrent pneumococcic meningitis have been reported.

Craddock and Bowers[4] cite their case of a 32-year-old Negro female with recovery after four attacks in one year. In this case the mode of entry for the organisms was not determined. Hopkins,[5] *et al.*, reported three attacks of pneumococcic meningitis in a period of four months in a 30-year-old female. The original attack followed an upper respiratory infection.

Labby[6] has reported 14 attacks in a 55-year-old male in a period of one year with recovery. Traut[7] has described the case of a seven-year-old girl who suffered five attacks of pneumococcic meningitis in a four-year period. Traut's patient suffered the first episode of meningitis two and one-half years after an uncomplicated skull fracture.

*Department of Otolaryngology, Washington University School of Medicine.

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CASE REPORT.

A 59-year-old white female entered Barnes Hospital on Jan. 25, 1944, in coma. About 36 hours before admission she complained of pain in her right ear and a fever. Twelve hours later she noted that the right ear had begun to drain, and with this she felt improved for a short period. During the night before admission the patient slept poorly, and in the morning she was in marked coma.

For several weeks prior to admission to the hospital the patient had been treated by her local physician for effusion of the right ear.

On admission, the temperature was 104.3° F., pulse 100, respirations 26, blood pressure 160/70. The patient was in marked coma; the legs and thighs were flexed. The neck was stiff. Kernig's and Brudzinski's signs were positive. The right ear canal contained thick, yellow-white discharge. A blowing systolic murmur was heard at the apex of the heart. Breathing was shallow, but lungs were clear to percussion and auscultation.

A lumbar puncture performed immediately revealed viscid, milky fluid. The cell count was 2,300 cells without acid and 2,150 cells with acid. The Pandy test was positive; protein, 560 mgm. per cent; sugar, 10 mgm. per cent; Wassermann was negative. Mice inoculated with cerebrospinal fluid and ear exudate revealed a Type 25 pneumococcus. Spinal fluid pressures could not be obtained because the patient became restless and began to toss in her bed when this procedure was attempted. Other laboratory data: red blood count, 4,010,000 with 11.7 gm. Hb.; white blood count, 19,550 with 68 segmented cells, 14 lymphocytes, five monocyte and 13 stab and juvenile forms; the urine contained two plus albumin; the Kahn test was negative.

The patient was given 2 gm. of sulfadiazine every four hours and continued on sulfadiazine therapy throughout her hospital stay.

X-ray Report: "There is haziness over the entire cellular structures of the right mastoid. The trabeculae appear somewhat thickened. Mastoid structures on the left appear to be within normal limits." An ear, nose and throat consultant (A. M. A.) saw the patient the third hospital day and found the right membrana tensa to be dull, thick and macerated. A simple mastoidectomy was performed at once. The lateral sinus was explored and found to be normal. The mastoid was quite sclerotic throughout. No breaks or dehiscences into the dura were found at surgery.

On the sulfadazine therapy the patient's postoperative course was uneventful and the patient gradually improved. She was discharged on Feb. 10, 1944.

The patient had no symptoms referable to her ears or to her meningitis for five years, then, on March 27, 1949, while at the theatre, the patient complained of moderate pain in the right ear. Several hours later the right ear began to drain pus and the patient felt more comfortable. On awakening the following morning, she complained of generalized headache and began to vomit. Two hours after awakening, the patient was comatose. On admission to the hospital on March 29, 1949, the patient was comatose and tossing about in bed. The neck was rigid. Kernig's and Brudzinski's signs were positive. The Babinski sign was negative. The right membrana tensa was quite red and a small posterior-inferior perforation was seen. The right ear canal was reddened and filled with serosanguinous fluid. The lungs were clear to percussion and auscultation. The heart rhythm was regular.

Spinal puncture was performed at once and revealed 800 cells. Type 13 pneumococcus was recovered. Red blood count was 4,400,000 with 14.3 gm. Hb.; white blood count was 8,600 with 61 segmented forms, 28 stab cells, five lymphocytes, five monocytes and one juvenile form; the urine contained three plus albumin.

The patient was given 1,000,000 units of penicillin intramuscularly every three hours, in addition to 1 gm. of sulfadiazine every four hours. Two days after admission the patient was rational and her temperature was normal. Her improvement was rapid and she was discharged on April 7, 1949. Five months after discharge she is well and free of symptoms.

SUMMARY.

A case of recurrent pneumococcic meningitis of otitic origin is presented. The second attack of meningitis occurred five years after the initial episode. Sulfadiazine therapy and mastoid surgery effected recovery with the first episode, and sulfadiazine and massive doses of penicillin resulted in recovery with the second attack.

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HEARING FOUNDATION ESTABLISHED.

Hearing Foundation, a new organization to cope with the social and psychological problems of the hard of hearing, has been formed by the hearing aid industry, it was announced by Fred J. Davis, president of the International Hearing Aid Association. S. Richard Stern, New York public relations counsel, has been named director of the new nonprofit organization, which will have the twofold purpose of alleviating public prejudice toward wearers of hearing aids, and of educating the hard of hearing to the important advances in hearing aids and to the modern rehabilitation techniques.

The Foundation is being supported by voluntary contributions from the entire industry, including hearing aid dealers, manufacturers of aids, component parts and batteries, and has the endorsement of key figures among the hard-of-hearing group as well as leading medical and social welfare authorities.

Plans for the Foundation include the immediate launching of a public relations campaign with three objectives: overcoming public prejudices, educating the hard of hearing to the important advances in hearing aids and the modern rehabilitation techniques, and developing an even greater awareness of all engaged in the industry to the public service aspects of their business.

In addition to its broad objectives, the Hearing Foundation plans to establish the "Hearing Advancement Awards" to go to those doing outstanding work in benefiting the hard of hearing, and to establish scholarships for the advanced study of hearing problems. Also planned is the "Children's Better Hearing Program," which seeks to gain more attention and assistance for the 300,000 hard-of-hearing children in the country. The Foundation will also campaign to eliminate job discrimation in industry and to correct working conditions injurious to hearing.

The campaign plans include the dissemination of information about hearing and hearing problems through all possible media, as well as the establishment of a speakers' bureau, utilization of pamphlets, slide films and similar educational techniques. The program will also be carried through institutional type ads run by local organizations, in which the various facts will be given to the public.

OCTOBER 1, 1949.

HEARING AIDS ACCEPTED BY THE COUNCIL ON PHYSICAL MEDICINE OF THE AMERICAN MEDICAL ASSOCIATION.

As of February 1, 1949.

Acousticon Model A-100.
Manufacturer: Dictograph Products Corp., 580 Fifth Ave., New York 19, N. Y.

Aurex (Semi-Portable); Aurex Model C-B, Model C-A, Model F and Model H.
Manufacturer: Aurex Corp., 1117 N. Franklin St., Chicago, Ill.

Beltone Mono-Pac; Beltone Harmony Mono-Pac; Beltone Symphonette.
Manufacturer: Beltone Hearing Aid Co., 1450 W. 19th St., Chicago, Ill.

Dysonic Model 1.
Manufacturer: Dynamic Hearing Aids, 43 Exchange Pl., New York 5, N. Y.

Electroear Model C.
Manufacturer: American Earphone Co., Inc., 10 East 43rd St., New York 17, N. Y.

Gem Hearing Aid Model V-35.
Manufacturer: Gem Ear Phone Co., Inc., 50 W. 29th St., New York 1, N. Y.

Maico Type K; Maico Atomeer.
Manufacturer: Maico Co., Inc., North Third St., Minneapolis, Minn.

Mears Aurophone Model 200; 1947—Mears Aurophone Model 98.
Manufacturer: Mears Radio Hearing Device Corp., 1 W. 34th St., New York, N. Y.

Micronic Model 101 (Magnetic Receiver).
Manufacturer: Micronic Co., 727 Atlantic Ave., Boston 11, Mass.

Microtone T-3 Audiomatic; Microtone T-4 Audiomatic; Microtone T-5 Audiomatic.

Manufacturer: Microtone Co., 4602 Nicollet Ave., Minneapolis 9, Minn.

National Cub Model; National Standard Model; National Star Model.

Manufacturer: National Hearing Aid Laboratories, 815 S. Hill St., Los Angeles 14, Calif.

Otarion Model A-1; Otarion Model A-3; Otarion Models A-4 J and S; Otarion Model E-1; Otarion Model E-1S; Otarion Model E-2; Otarion Model E-4.

Manufacturer: Otarion Hearing Aids, 159 N. Dearborn St., Chicago, Ill.

Paravox Models VH and VL; Paravox Model XT; Paravox Model XTS; Paravox Model Y (YM, YC and YC-7).

Manufacturer: Paraphone Hearing Aid, Inc., 2056 E. 4th St., Cleveland, Ohio.

Radioear 45-CM; Radioear Model 45-M-magnetic air conduction receiver; Radioear Model 45-M-magnetic bone conduction receiver; Radioear Permo-Magnetic Uniphone; Radioear Permo-Magnetic Multipower.

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Manufacturer: Sonotone Corp., Elmsford, N. Y.

Superfonic Hearing Aid.

Manufacturer: American Sound Products, Inc., 2454 S. Michigan Ave., Chicago, Ill.

Televox Model E.

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Telex Model 22; Telex Model 97; Telex Model 99; Telex Model 612; Telex Model 900; Telex Model 1020; Telex Model 1550; Telex Model 1700.

Manufacturer: Telex, Inc., Minneapolis 1, Minn.

Tonemaster Model Royal.

Manufacturer: Tonemasters, Inc., 1627 Pacific Ave., Dallas 1, Tex.

Trimm Vacuum Tube No. 300.

Manufacturer: Trimm, Inc., 400 W. Lake St., Libertyville, Ill.

Unex Model "A"; Unex Midget Model 95; Unex Midget Model 110.

Manufacturer: Nichols & Clark, Hathorne, Mass.

Vacolite Model J.

Manufacturer: Vacolite Co., 3003 N. Henderson St., Dallas 6, Tex.

Western Electric Orthotronic Model; Western Electric Model 63; Western Electric Model 64; Western Electric Models 65 and 66.

Manufacturer: Western Electric Co., Inc., 120 Broadway, New York 5, N. Y.

Zenith Radionic Model A-2-A; Zenith Radionic Model A-3-A; Zenith Radionic Model B-3-A; Zenith Model 75; Zenith Miniature 75.

Manufacturer: Zenith Radio Corp., 6001 Dickens Ave., Chicago, Ill.

All of the accepted hearing devices employ vacuum tubes.

TABLE HEARING AIDS.

Precision Table Hearing Aid. *Jour. A. M. A.*, 139:785-786, March 19, 1949.

Manufacturer: Precision Electronics Co., 850 West Oakdale Ave., Chicago 14, Ill.

Sonotone Professional Table Set Model 50. Report not yet published.

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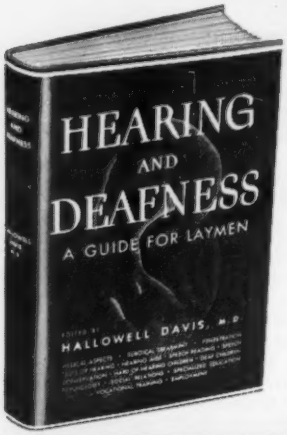

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